E WAD 2917
FF # 3C
8/20/93





# PROJECT MEMORANDUM

DATE: August 20, 1993

TO: John Stiller

CC: Gary Podrabsky
Nate Mathews
Dave Haddock

FROM: Joe Depner JD

PROJECT: Burlington Environmental Inc. Pier 91 RFI

**SUBJECT: SUBMITTAL OF DATA PACKAGE TO USEPA IN SUPPORT OF VARIANCE REQUEST**

Attached is a data package to be submitted to Mr. David Croxton of the U.S. Environmental Protection Agency (USEPA), Region X, Seattle. These data are relevant to the Work Plan variance request that Burlington submitted to the USEPA in March 1993. The variance involves substitution of Port of Seattle (Port) monitoring well MW-39-3 for proposed well CP-120, for quarterly groundwater sampling. Recall that during a meeting with Mr. Croxton on August 9, 1993 we agreed to submit these data to the USEPA. Please review the attached wording and data and contact me if you have any questions or comments. Thank you.

JSD\g:\usesrs\beckyk\disk51\2417.mem

# BACKUP DATA FOR
# BURLINGTON PIER 91 RFI WORK PLAN
# VARIANCE REQUEST

August 20, 1993

As per the meeting held on August 9, 1993, between representatives of Burlington Environmental Inc. (Burlington) and the U.S. Environmental Protection Agency (USEPA), Burlington presents the attached data to the USEPA. These data are relevant to the Pier 91 RFI Work Plan variance request that Burlington submitted to the USEPA in March 1993. The variance involves substitution of Port of Seattle (Port) monitoring well MW-39-3 for proposed monitoring well CP-120, for quarterly groundwater sampling.

The data package contains the following elements:

- a copy of the report (Harding Lawson Associates, 1990) that was prepared at the time well MW-39-3 was installed. This report, which presents the results of a tank removal investigation, includes the following information:
  - geologic logs/construction diagrams for Port wells MW-39-1, MW-39-2, and MW-39-3
  - a site map showing the locations of the above wells
  - the results of soil/groundwater/product chemical analyses performed as part of the tank removal investigation
- geologic logs/construction diagrams and soil sample analysis results for monitoring wells CP-104A, CP-107, and CP-112;
- geologic log and soil and groundwater sample analysis results for borehole TB-2;
- geologic log and groundwater sample analysis results for borehole HA-2;
- analysis results for groundwater samples collected from monitoring wells MW-39-3, CP-104A, CP-107, and CP-112 during the April 1993 and July 1993 sampling events; and
- analysis results for nonaqueous-phase liquid samples collected from monitoring wells MW-39-3 and CP-107 during the April 1993 sampling event.

Elevations of groundwater and/or NAPL levels are not yet available because Burlington has not yet received the land surveyor's report. Receipt of this report is expected by the end of August.

Sources of the attached data are summarized in Table 1.

Table 1

DATA SOURCES

| Borehole/Well | Geologic Log/ Construction Diagram | Soil Sample Results | Groundwater Sample Results | | | |
|---|---|---|---|---|---|---|
| | | | 12/87 | 12/88 to 2/89 | 04/93 | 07/93 |
| TB-2 | 3 | 4 | 3 | 3, 4 | N/A | N/A |
| HA-2 | 1 | N/A | 1 | N/A | N/A | N/A |
| MW-39-1 | 5 | 5 | N/A | N/A | N/A | N/A |
| MW-39-2 | 5 | 5 | N/A | N/A | N/A | N/A |
| MW-39-3 | 5 | 5 | N/A | N/A | 6 | 6 |
| CP-104A | 1 | 1 | 2 | 3 | 6 | 6 |
| CP-107 | 3 | 4 | N/A | 3, 4 | 6 | 6 |
| CP-112 | 6 | 6 | N/A | N/A | 6 | 6 |

N/A - Not applicable

Key to Data Sources

1. Sweet-Edwards / EMCON, Inc., Phase 1 Hydrogeologic Investigation, Chemical Processors, Inc. Pier 91 Facility, May 1988.

2. Sweet-Edwards / EMCON, Inc., Phase 1 Hydrogeologic Investigation, Chemical Processors, Inc. Pier 91 Facility, February 1988.

3. Sweet-Edwards / EMCON, Inc., Hydrogeologic Investigation, Pier 91 Facility, Chemical Processors, Inc. Vol. 1 April 24, 1989.

4. Sweet-Edwards / EMCON, Inc., Hydrogeologic Investigation, Pier 91 Facility, Chemical Processors, Inc. Vol. 2, Appendix E, April 24, 1989.

5. Harding Lawson Associates, Underground Storage Tank Investigation in the Vicinity of the City Ice Building, Terminal 91 for the Port of Seattle, June, 1990.

6. Burlington Environmental Inc., Unpublished data collected during ongoing RFI.

JSD/g:\users\beckyk\disk51\2417.mem

A Report Prepared for

Port of Seattle
Pier 66
Seattle, Washington 98111

# UNDERGROUND STORAGE TANK INVESTIGATION IN THE VICINITY OF THE CITY ICE BUILDING TERMINAL 91 FOR THE PORT OF SEATTLE

HLA Job No. 14124,011.09

by

Susan C. Walker
Staff Geologist

Glen M. Wyatt
Associate Hydrogeologist

Harding Lawson Associates
1325 Fourth Avenue
Suite 2110
Seattle, Washington 98101
(206) 622-0812

June 18, 1990

# TABLE OF CONTENTS

## LIST OF TABLES



## LIST OF FIGURES

# 1.0 INTRODUCTION

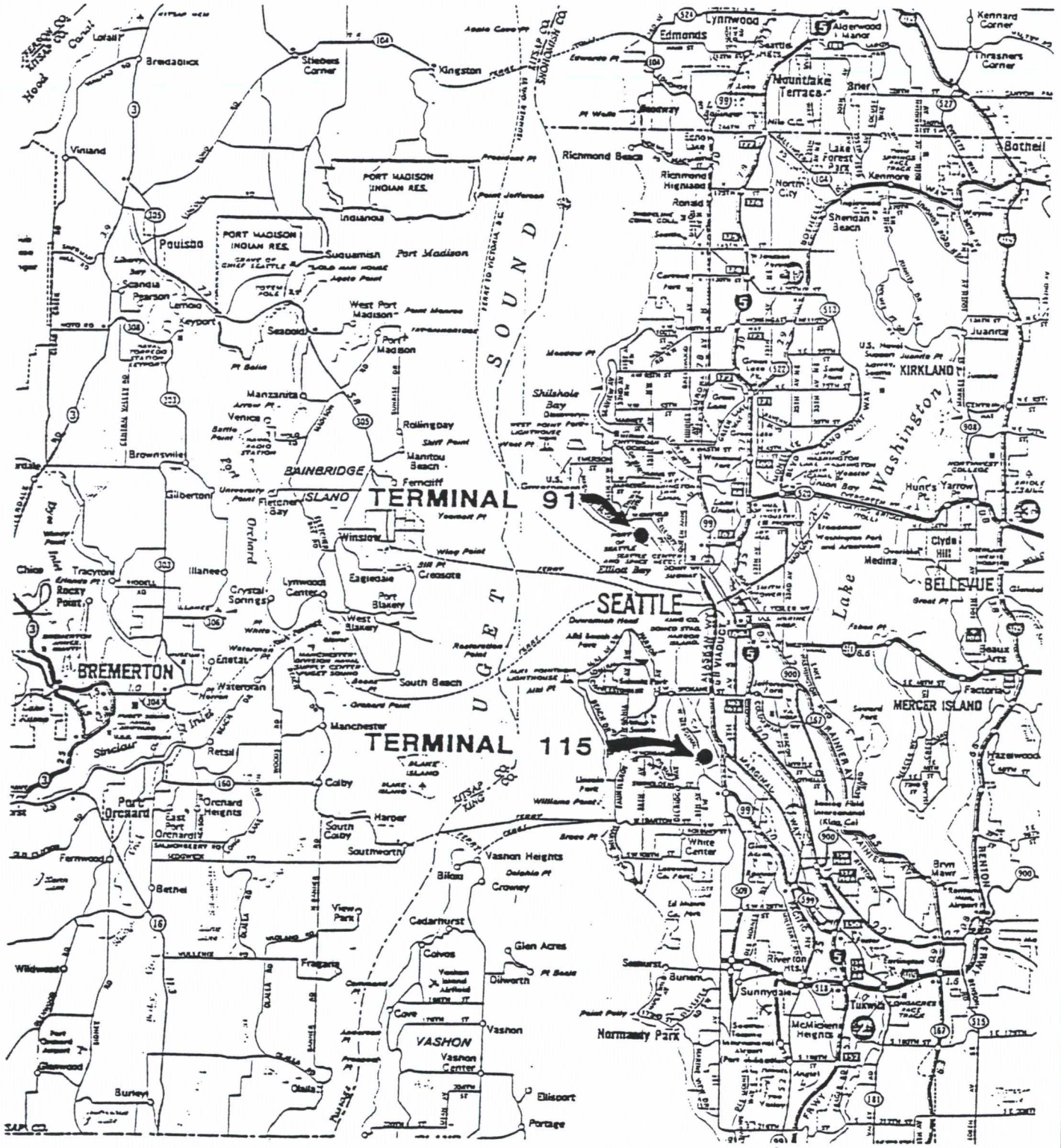
This report presents results of the soil and groundwater investigation performed by Harding Lawson Associates (HLA) in the vicinity of the Tank 91N site at the Port of Seattle's (Port) Terminal 91 (Figure 1-1). This work was authorized by an agreement dated December 15, 1989, between the Port and HLA. The work authorized included observation of underground storage tank (UST) removal, soil sampling during tank removal, installation of three monitoring wells, and soil and groundwater analyses.

Tank 91N was removed from Terminal 91 on December 22, 1989. The tank was an approximately 650-gallon steel tank used for storage of diesel fuel. The tank was located approximately 10 feet north of the old City Ice building (Cold Storage Warehouse, Building W-39 on Figure 1-2) and held fuel used for a standby generator at the building.

## 1.1 BACKGROUND

Hydrocarbon contamination of soils and groundwater in the vicinity of the Tank 91N site has been documented during investigations for construction of the new City Ice building (Building W-390) north of the Tank 91N site and by an investigation of the Chemical Processors, Inc. (Chempro) facility east of the Tank 91N site. GeoEngineers, Inc. reported that shallow groundwater in the vicinity of the Building W-390 site contained 5 part per million (ppm) petroleum hydrocarbons, 0.030 ppm benzene, 20 ppb orthoxylene, and a trace of diesel fuel ("Summary of Supplemental Monitor Well Measurements," August 31, 1987).

Hydrogeologic investigations have been conducted in the vicinity of the Chempro site since late in 1987 by Sweet Edwards/EMCON Inc. (SE/E), as described in the SE/E report "Hydrogeologic Investigation, Pier 91 Facility, Chemical Processors, Inc.," dated April 24, 1989 and summarized below. The site is underlain by a shallow water-table aquifer composed of 15 to 20 feet of sand and gravel deposited as fill, having a horizontal hydraulic conductivity of $10^{-2}$ to $10^{-4}$ centimeters per second (cm/sec). Groundwater in this aquifer generally flows to the southwest at hydraulic gradient of 0.002 (2 feet change in head per 1,000 feet horizontally). The HLA investigation near the Tank 91N site is limited to the shallow water-table aquifer.




LOCATION MAP

Harding Lawson Associates

Engineering and Environmental Services

PORT OF SEATTLE

FIGURE 1-1

| DRAWN | JOB NUMBER | APPROVED | DATE |
|---|---|---|---|
| NDK | 1412401109 | GW | |

SE/E installed three shallow monitoring wells (CP-104-A, CP-107, and CP-110) and one temporary boring (TB-2) between Building W-39 and the Chempro facility (Figure 1-3). Based on the groundwater flow direction reported by SE/E (to the southwest), TB-2 and CP-104A are hydraulically upgradient of the Tank 91N site. Benzene, toluene, ethylbenzene, and xylene (BTEX) compound concentrations totaling 78 ppm were detected in a near-surface soil sample from TB-2. Significant concentrations of other volatile and semivolatile organic compounds were also present in soils from this boring.

Free product was reported by SE/E on the water table in CP-107 and TB-2. BTEX concentrations in water from TB-2 in March 1989 were 1.0, 2.4, 0.48 and 1.1 ppm, respectively. BTEX concentrations from the March 1989 sampling of CP-104-A were 0.0059, 0.020, 0.0055, and 0.020 ppm, respectively. Organic constituents in the water that exceeded EPA maximum contaminant levels included vinyl chloride and 1,1-dichloroethene in CP-104-A and TB-2.

Underneath the fill is a silty sand aquitard which extends to a depth of 30 to 45 feet. A confined aquifer composed of gravelly sand underlies the aquitard. Well CP-104-B was installed in the lower aquifer. The groundwater flow direction in this aquifer is south to southeast and the horizontal hydraulic gradient is approximately 0.007. SE/E reported that water levels in wells in this aquifer were affected by tidal fluctuations and that a downward hydraulic gradient of 0.023 was present at CP-104. SE/E measured horizontal hydraulic conductivities from $10^{-3}$ to $10^{-4}$ cm/sec and reported the average hydraulic conductivity as $10^{-2}$ cm/sec. Concentrations of organic compounds were near or below detection limits in the confined aquifer.

## 1.2 REMOVAL OF TANK 91N

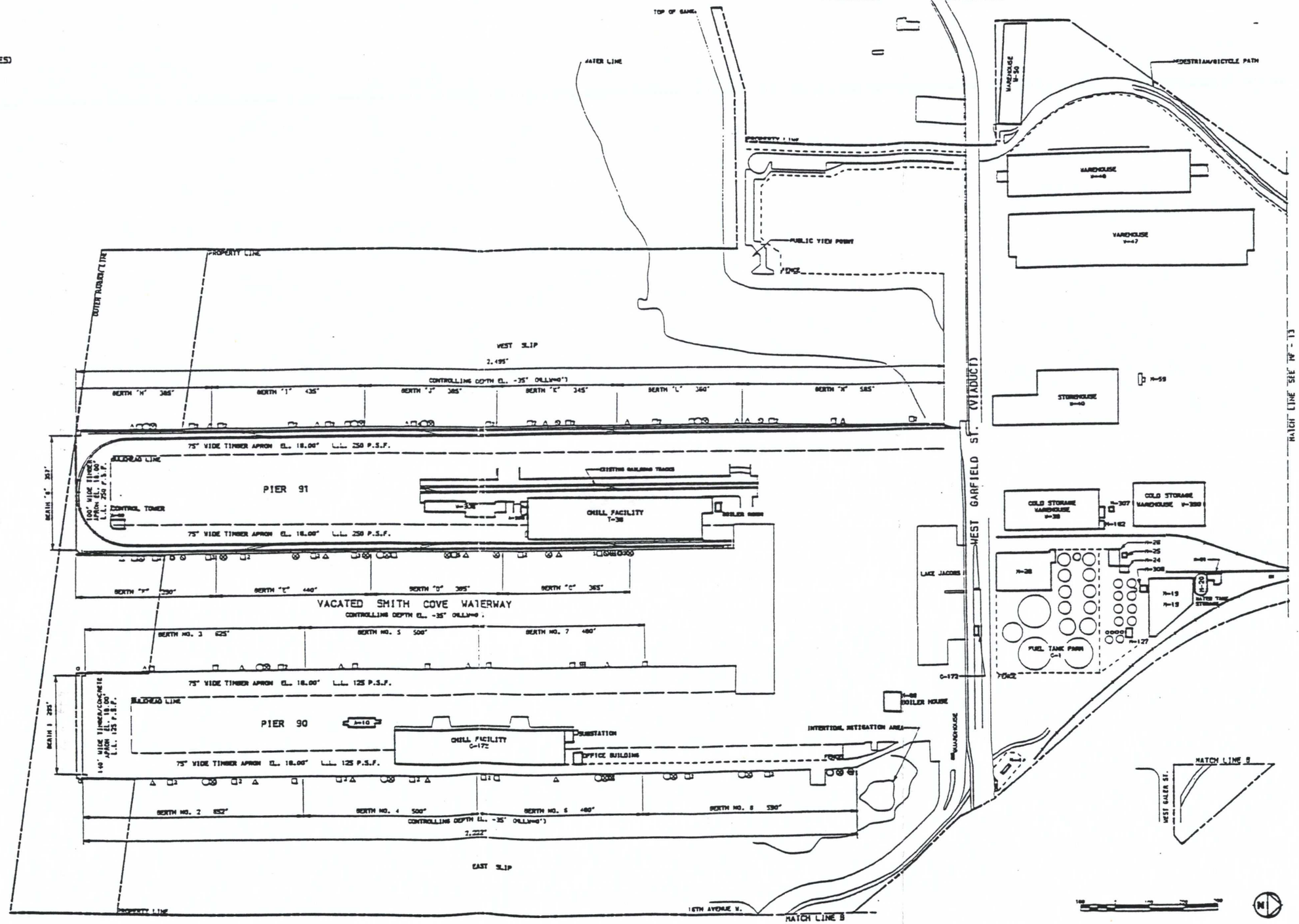
Meridian Excavating removed Tank 91N from the area outside of the northeast corner of Building W-39 on December 22, 1989. HLA personnel were on site during the tank removal to observe the conditions of the UST system and to document the conditions of soils and groundwater in the tank excavations. Information previously supplied by to HLA by the Port indicated that soils in the vicinity of this tank had up to 50,000 ppm of total petroleum hydrocarbons.

TOTAL AREA

TERMINAL 91 9,394,236 S.F. (215.6619 ACRES)

RAILROAD SWITCHING

RESPONSIBILITY OF BURLINGTON NORTHERN.




ELLIOTT BAY

NOTE:

SEE SHEET MF-13 FOR BUILDING SCHEDULE.

LEGEND

ODDSIDE FACILITIES

- SHIPS HYDRANT
- 120 VOLT
- 208 VOLT — ELECTRICAL OUTLETS
- 480 VOLT
- TELEPHONE OUTLET
- INTERCOM
- STEAM
- FUEL
- DIESEL
- SLUDGE
- □2 = NUMBER OF UTILITIES AVAILABLE

PROJECT ENGINEER:
DESIGNED:
DRAWN BY:
SCALE:
DATE:
CHECKED BY:

REVISIONS

| NO. | DATE | BY | APP'D |
|---|---|---|---|

| NO. | DATE | BY | APP'D |
|---|---|---|---|

PORT OF SEATTLE

PROJECT ENGINEER: STEVEN N. OKAMURA
DESIGNED: MICHAEL A. COMPUT
DRAWN BY: BJS/YAP/MAC
APPROVED BY:
SCALE: NOTED
DATE: DEC 16 1988
CHECKED BY: F13458/8090

MARINE FACILITIES
TERMINAL 91
( SOUTH )

ADDRESS: 2001 WEST GARFIELD STREET 98119

FIGURE 1-2

Immediately prior to removal, Meridian added dry ice to the tank to expel flammable vapors. The Seattle Fire Department subsequently determined that the tank was safe for removal. Overlying soil and asphalt cover was excavated by Meridian using a tire-mounted backhoe.

The uppermost excavated soil was dark brown and became gray to the 2-foot depth, apparently stained and saturated with petroleum product. In the northeast corner of the tank pit there was a black layer of gravelly sand, approximately one- to two-feet thick, extending towards the south and west ends of the tank pit. Initial organic vapor meter (OVM) readings of 18 ppm, calibrated to isobutylene gas, were obtained from the gray soil. No OVM response was recorded from the dark brown soil.

An approximately 3-feet thick, 2.5-feet wide by 4-feet long concrete block was on top of the tank. Once the block was removed, two puncture holes were observed in the middle of the top of the tank. During excavation, the backhoe put a large hole and dent on the north end of the tank. No corrosion holes were observed in the middle and north end of the tank. Corrosion pits and numerous corrosion holes (up to 1/2-inch diameter) were noticed on top half of the south end of the tank and on the tank top near the intake pipe. The steel tank was buried 3 feet below grade and was 8 feet long and 46 inches in diameter. A steel tag attached to the tank identified the manufacturer as Amick Sheet Metal Works and the capacity as 672 gallons.

Pipes in the west and east side of the tank pit, approximately 3 feet below ground surface, were very rusted. However, no obvious holes were observed. The tank was not anchored in place from below and no concrete pad was present beneath the tank.

HLA collected a soil sample from the southwest corner of the tank pit, from the saturated, black gravelly sand, that had a diesel odor. An OVM reading of 73 ppm was taken from this sample. HLA also sampled gray stained soil that had a very slight diesel odor and OVM reading of 50 ppm, from the northeast corner of the tank pit. Both samples were collected from just below the former tank position at approximately 6 feet below ground surface. No groundwater was encountered in the hole. Following excavation of the tank, Meridian filled the hole with the excavated soil and clean fill material.

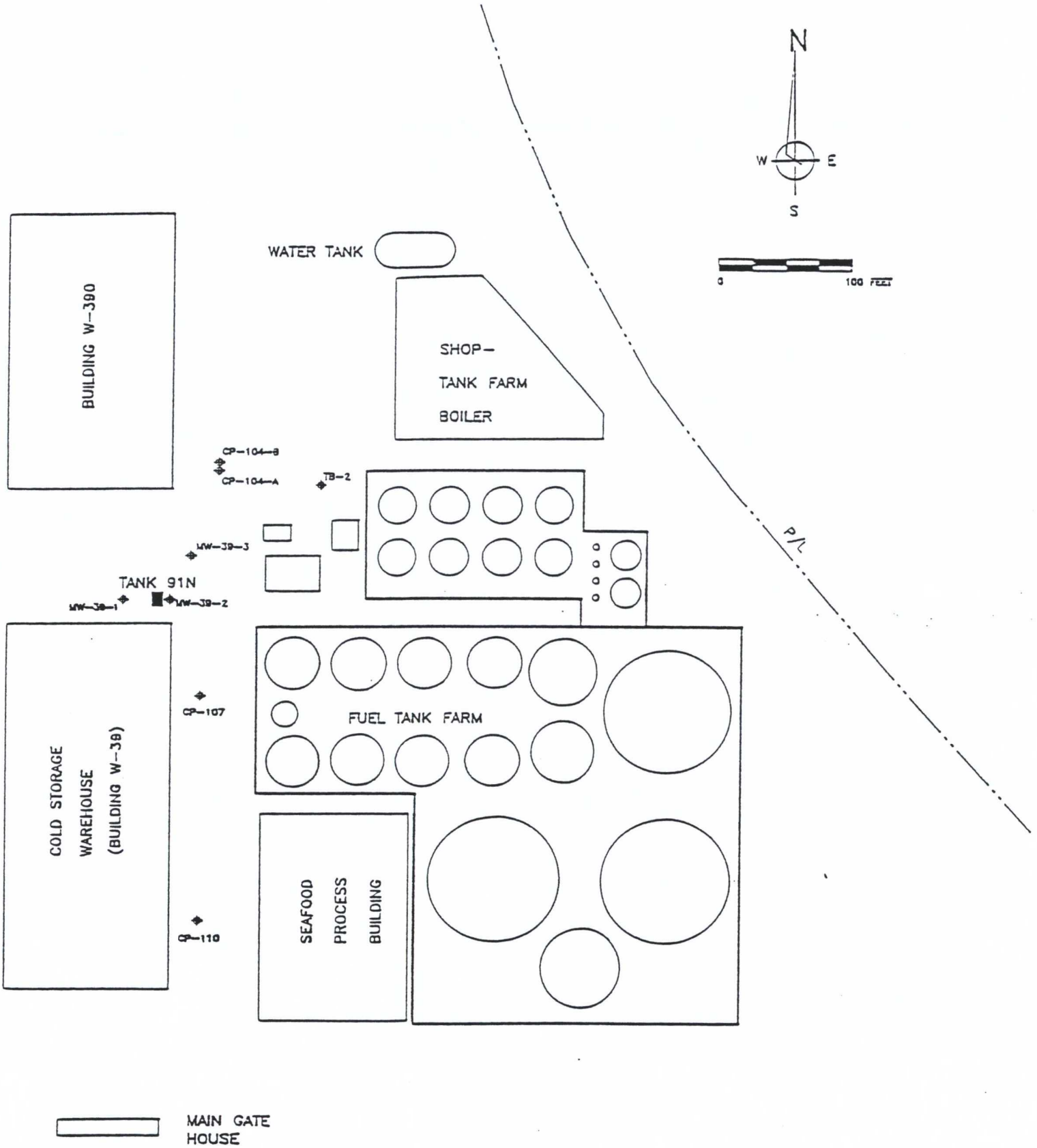



FIGURE 1-3
BUILDING W-39 VICINITY MAP

Immediately prior to removal, Meridian added dry ice to the tank to expel flammable vapors. The Seattle Fire Department subsequently determined that the tank was safe for removal. Overlying soil and asphalt cover was excavated by Meridian using a tire-mounted backhoe.

The uppermost excavated soil was dark brown and became gray to the 2-foot depth, apparently stained and saturated with petroleum product. In the northeast corner of the tank pit there was a black layer of gravelly sand, approximately one- to two-feet thick, extending towards the south and west ends of the tank pit. Initial organic vapor meter (OVM) readings of 18 ppm, calibrated to isobutylene gas, were obtained from the gray soil. No OVM response was recorded from the dark brown soil.

An approximately 3-feet thick, 2.5-feet wide by 4-feet long concrete block was on top of the tank. Once the block was removed, two puncture holes were observed in the middle of the top of the tank. During excavation, the backhoe put a large hole and dent on the north end of the tank. No corrosion holes were observed in the middle and north end of the tank. Corrosion pits and numerous corrosion holes (up to 1/2-inch diameter) were noticed on top half of the south end of the tank and on the tank top near the intake pipe. The steel tank was buried 3 feet below grade and was 8 feet long and 46 inches in diameter. A steel tag attached to the tank identified the manufacturer as Amick Sheet Metal Works and the capacity as 672 gallons.

Pipes in the west and east side of the tank pit, approximately 3 feet below ground surface, were very rusted. However, no obvious holes were observed. The tank was not anchored in place from below and no concrete pad was present beneath the tank.

HLA collected a soil sample from the southwest corner of the tank pit, from the saturated, black gravelly sand, that had a diesel odor. An OVM reading of 73 ppm was taken from this sample. HLA also sampled gray stained soil that had a very slight diesel odor and OVM reading of 50 ppm, from the northeast corner of the tank pit. Both samples were collected from just below the former tank position at approximately 6 feet below ground surface. No groundwater was encountered in the hole. Following excavation of the tank, Meridian filled the hole with the excavated soil and clean fill material.

# 2.0 SOIL AND GROUNDWATER INVESTIGATION

The "Draft Work Plan for Underground Storage Tank Investigations at Terminals 91 and 115 for the Port of Seattle" dated January 12, 1989 was used as a basis for the field investigation described below. Modifications to the planned field investigation were made during meetings with Port personnel and as the field investigation progressed.

## 2.1 DRILLING AND SOIL SAMPLING

HLA began the soil and groundwater investigation of the Tank 91N site on January 16, 1990 to assess the extent of hydrocarbons in the soil and groundwater at the tank site. Three monitoring wells (MW-39-1, -2, and -3) were installed and sampled (Figure 1-3). Prior to drilling the boreholes, the locations of electrical, steam, water, gas, telephone, and sewer lines were marked in the vicinity of the site. Concrete cutting was required for drilling boreholes MW-39-1 and MW-39-2.

Drilling and soil sampling was performed using a truck-mounted Mobile B-61 drill rig equipped with hollow-stem augers, owned and operated by Hokkaido Drilling and Development Corporation of Graham, Washington. Four-inch inside-diameter hollow-stem augers were used for drilling MW-39-1. Because heaving sands were encountered while drilling this borehole, 6-inch inside diameter augers were used during drilling the other boreholes. Water was added to the augers while drilling to maintain hydrostatic head in the augers to minimize the amount of sand flowing into the augers.

A split-spoon sampler, lined with three 2-inch diameter by 6-inch long brass tubes, was used to obtain soil samples at 2.5 feet below grade and at subsequent five-foot intervals. The sampler was driven 18 inches below the auger bit using a 140-pound hammer falling 30 inches and the number of blows required for each 6-inch interval were recorded. The lowermost brass tube from each sample was sealed with aluminum foil, capped with plastic caps, and saved for laboratory analysis.

Soil was visually classified using the Unified Soil Classification System. Soil samples were monitored for visual indications of product and organic vapors using odors and OVM measurements in the field. The presence of vapors, hydrocarbon odors, or visual evidence of petroleum product in the soils was logged. Soil hydrocarbon vapor measurements were made by extracting soil from the sampler tip and/or middle brass tube into a plastic bag and aspirating the vapors. The OVM was calibrated with isobutylene gas. The OVM was not functioning during the drilling of MW-39-1.

No evidence of hydrocarbon contamination was seen in soils from the MW-39-1 borehole. Product saturated soils were encountered in soils above the water table in the other two boreholes.

An on-site mobile laboratory equipped with a Hewlett-Packard 5890 gas chromatograph, operated by Enviros Laboratories of Bellevue, Washington, was initially used at Terminal 91 tank site. The on-site mobile laboratory provided rapid analyses of soils using modified EPA Method 8015 for petroleum hydrocarbon fingerprinting. The mobile laboratory was used only during drilling of MW-39-1, because field conditions made drilling and well installation slower than anticipated. Remaining soil samples were analyzed by Enviros in their Bellevue laboratory.

A steel pipe that had not been located and marked was encountered while drilling MW-39-3. The borehole was moved and a different pipe was encountered. The borehole was successfully drilled approximately five feet east of the original location. The abandoned boreholes were filled with bentonite chips and capped with cement.

All down-hole equipment was steam-cleaned prior to drilling each hole. The soil sampling equipment was cleaned with detergent and rinsed with tap water followed by distilled water prior to obtaining each sample.

## 2.2 MONITORING WELL INSTALLATION

Monitoring wells were installed in the three boreholes (Table 2-1). Two-inch diameter flush-threaded Schedule 40 polyvinyl chloride (PVC) casing and screen (with 0.020-inch machine-cut slots) was used for well construction. A bottom threaded cap and top locking cap were installed on each well. The top of each well screen was placed approximately 2 feet above the water

table. Wells were sand-packed with Lone Star number 2/16 Lapis Lustre sand and sealed with approximately one foot of bentonite chips. A traffic-rated street box was cemented into the surface at each site.

During installation of MW-39-1, sand bridged between the augers and well casing, raising the well. Water was added to the borehole to loosen the casing in order to jet the casing into place.

Table 2-1. Monitoring Well Construction.

| Well Number | Date Completed | Borehole Depth (feet) | Screened Interval (feet) | Top of Sand Pack (feet) | Depth to Top of Casing (feet below grade) |
|---|---|---|---|---|---|
| MW-39-1 | 1/18/90 | 17.5 | 3.8-13.8 | 3.0 | 0.63 |
| MW-39-2 | 1/18/90 | 14.8 | 4.0-14.0 | 2.8 | 0.79 |
| MW-39-3 | 1/19/90 | 14.0 | 4.0-14.0 | 2.0 | 0.42 |

All soil cuttings and water derived from drilling, sampling, and cleaning was stored on-site in 55-gallon barrels. The soil cuttings were removed and soil was disposed of by Field Support Services, Inc.

Ground elevation and location data were supplied by the Port, and are included on the logs of borings in Appendix A.

## 2.3 WELL DEVELOPMENT AND SAMPLING

The three wells were developed by surging and bailing on January 26, 1989 (Table 2-2). Water levels were recorded in feet below the top of casing (btoc). Product or a product sheen was noted in MW-39-2 and -3. One casing volume in each well was approximately 1.5 gallons; therefore, 13 to 16 casing volumes were removed from each well during development.

Table 2-2. Well Development Information.

| Well Number | Depth to Water (feet, btoc) | Volume Removed During Development (gallons) | Final pH (units) | Final Temperature (°C) |
|---|---|---|---|---|
| MW-39-1 | 4.58 | 25 | 7.7 | 11.3 |
| MW-39-2 | 4.42 | 20 | 7.1 | 12.1 |
| MW-39-3 | 4.83 | 20 | 7.0 | 12.1 |

MW-39-1 and -2 were subsequently sampled on February 12, 1990 (Table 2-3). Static water levels in each well and the presence and thickness of free product, if present, was monitored. MW-39-3 was not sampled because 0.85 feet of product was measured on top of the water, using a gauging bailer. Prior to sampling, both wells were purged using a hand-powered diaphragm pump. Temperature, pH, and conductivity of the water was monitored during purging. Samples were collected with a stainless-steel bailer after a minimum of 15 well volumes had been purged. Final temperature, pH, and conductivity measurements are given in Table 2-3.

Table 2-3. Groundwater Sampling Data.

| Well Number | Purge Volume (gallons) | pH (units) | Temperature (°C) | Specific Conductance (umhos/cm) |
|---|---|---|---|---|
| MW-39-1 | 28 | 7.4 | 8 | 525 |
| MW-39-2 | 24 | 7.1 | 8 | 470 |

Water samples were poured from the bailer into sample containers in a manner to minimize aeration of the samples during the transfer process. The samples were retained in 40-milliliter vials. Water from the two wells was turbid, gray, had a moderate product odor, and had a slight product sheen. Care was taken to allow no air bubbles or headspace in the vials. The samples were labeled, wrapped to prevent breakage, and stored in an ice-filled cooler during field activities and transit to the laboratory. All samples were logged on chain-of-custody forms and delivered to Enviros' laboratory for analysis using modified EPA method 8015.

Monitoring and sampling equipment was decontaminated prior to use in each well by washing with a laboratory-grade detergent and rinsing with distilled water. Decontaminated sample vials were supplied by the laboratory.

## 2.4 WATER-LEVEL MEASUREMENTS

Table 2-4 summarizes water-level measurements following well completion. Free product was observed in MW-39-2 and -3. The depth to water or free product was measured from the north side of the top of the PVC well casing. Because product, with a typical specific gravity of 0.85, is lighter than water, the measured depth to product is less than the depth to the water table. Where necessary, the water table depth was determined by adding the product thickness multiplied by the difference between the specific gravities of product and water, to the depth to fluid measurement.

Table 2-4. Water-Level Measurements.

| Well Number | Top of Casing Elevation (feet) | Date | Depth to Fluid (feet, btoc) | Product Thickness (feet) | Water Table Elevation (feet) |
|---|---|---|---|---|---|
| MW-39-1 | 16.65 | 2/12/90 | 4.23 | None | 12.42 |
| | | 6/15/90 | 4.86 | None | 11.79 |
| MW-39-2 | 16.85 | 2/12/90 | 3.90 | None | 12.95 |
| | | 6/15/90 | 4.65 | 1 (approx) | 12.05 |
| MW-39-3 | 17.34 | 2/12/90 | 5.02 | 0.85 | 13.04 |
| | | 6/15/90 | 5.10 | 0.85 | 12.11 |

Based on the water-level elevations given in Table 2-4, groundwater flows in the west to northwest direction. The hydraulic gradient is approximately 0.01.

Free product was also observed on the water surface in the SE/E well CP-107 on January 19, 1990. The depth to water was approximately 5.5 feet below grade and approximately one-eighth of an inch of product was present on the water surface.

## 2.5 AQUIFER TESTING

During development, it was noted that water levels recovered almost immediately after bailing. For this reason, slug tests were not performed. Instead, hydraulic conductivity estimates were made using recovery data from well purging before sampling. The static water level, volume pumped from the wells before sampling, duration of pumping, and at least one recovery water-level measurement were recorded. Order-of-magnitude estimates of the hydraulic conductivity of the soils at each site were made using Skibitzke's residual drawdown method (Appendix A). The estimated hydraulic conductivity of the soils in the vicinity of MW-39-1 and MW-39-2 is $10^{-2}$ cm/sec, which agrees with the value reported by SE/E for the Chempro site.

## 2.6 LABORATORY ANALYSES

Enviros analyzed soil and groundwater samples collected during the removal of Tank 91N and the installation and sampling of the monitoring wells. Laboratory reports are included in Appendix B.

Table 2-5 lists the results of soil sampling. Samples S-3-SW and S-3-NE were obtained from the tank excavation. Samples from MW-39-1 were analyzed for total fuel hydrocarbons (TFH) using EPA Method 8015, modified, in Enviros' mobile laboratory. Other TFH analyses were performed in Enviros' Bellevue laboratory. Total petroleum hydrocarbons (TPH) analyses were performed by an Enviros subcontract laboratory.

Fuel type was characterized during TFH analyses. Number 2 diesel fuel was generally identified as the type of fuel hydrocarbon present in the soil samples. Light hydrocarbons (BTEX) characteristic of gasoline were not identified in the gas chromatograms from the TFH analyses. Heavier hydrocarbons are also present in the soils, as indicated by the high concentrations of TPH.

Water samples from MW-39-1 and MW-39-2 were also analyzed for TFH concentration by Enviros in their Bellevue laboratory. TFH was not detected in the sample from MW-39-1 (<1 ppm). The TFH concentration in the water sample from well MW-39-2 was 5 ppm.

Table 2-5. Soil Sample Analyses.

| Sample Number | Sample Depth (feet) | Vapor Reading (ppm) | TFH By 8015 (ppm) | TPH By 418.1 (ppm) | Fuel Type |
|---|---|---|---|---|---|
| S-3-SW | 6.0 | 73 | 16,000 | 77,882 | Diesel/Kerosene |
| S-4-NE | 6.0 | 50 | 15,000 | 28,544 | Diesel/Kerosene |
| MW-39-1-1 | 3.5 | -- | <1.0 | -- | None |
| MW-39-1-2 | 8.5 | -- | <1.0 | -- | None |
| MW-39-2-1 | 5.0 | 63 | 7,600 | 28,454 | Diesel Fuel #2 |
| MW-39-2-2 | 8.5 | 39 | 3,500 | 10,083 | Diesel Fuel #2 |
| MW-39-3-1 | 3.5 | 9 | <1.0 | -- | None |
| MW-39-3-2 | 8.5 | 30 | 1,300 | -- | Diesel Fuel #2 |

## 3.0 DISCUSSION

Hydrocarbon contamination is present in the soils adjacent to and upgradient of the site of Tank 91N, removed in December 1989. Upgradient contamination has been present since at least August 1987 (GeoEngineers, 1987). Free product was observed during excavation for foundations of the W-390 building north (upgradient) of the site in 1987 (Chempro, personal communication). Concentrations of diesel fuel in the soils encountered during drilling of MW-39-2 and MW-39-3 greatly exceed the Department of Ecology's (Ecology) soil cleanup guidance level of 200 ppm for hydrocarbons in soils.

Free product was observed in soil samples from above the water table while drilling MW-39-2 and MW-39-3. Free product was observed floating on water in well CP-107 and in MW-39-3 in January and February, 1990. Free product was not seen on the water surface in well MW-39-2 in February; however, the water table elevation in January and February 1990 was higher than normal because of higher than average precipitation. The water table elevation in December, at the time Tank 91N was removed, was at least two feet below the January and February level.

Approximately 10 inches of free product was present in upgradient well MW-39-3, and a trace was observed in wells installed during the Chempro site investigation. Groundwater in the vicinity of the former tank site has not been significantly affected by diesel fuel because of diesel fuel's low solubility. The TFH concentration of 5 ppm in water from well MW-39-2 was below Ecology's cleanup level of 15 ppm.

Residual product was apparently in the soil pore spaces beneath the water table during the construction of well MW-39-2 . Laboratory analyses of the samples from 4.5 to 5 and 8 to 8.5 feet below grade contained 1 to 3 percent petroleum hydrocarbons. The water table was approximately 1 to 4 feet above the depth of these samples. As diesel fuel is generally not soluble in water, the high concentrations of product in these samples suggests that product remained adsorbed on soils as the water table elevation rose.

Free product was observed in MW-39-2 on June 14, 1990. The depth to the top of free product was beneath the top of the well screen. Free product had apparently entered the well

after the water table elevation decreased from mid February. The thickness of free product could not be accurately measured, but is estimated to be approximately one foot.

Local contamination of the soils in the vicinity of the tank caused by leaks in the tank or normal operations is suggested by the high product concentrations in the soil samples from the tank excavation and MW-39-2.

## 3.1 SITE REMEDIATION OPTIONS

As in any site cleanup, free product must be eliminated or recovered to reduce the amount of contaminated soils above the water table and to reduce the residual contamination below the water table. Site cleanup plans must take into account the amount of free product, concentrations of dissolved organics in the groundwater, the shallow depth to water, extent of contamination in and around the former tank site, relatively high permeability and thinness of the aquifer, loose nature of the sands which comprise the aquifer, and the presence of buried utilities throughout the site. Additionally, the method used for remediation of the site must not interfere with operations at Terminal 91.

Free product may be recovered using a french drain system that includes large-diameter collector wells equipped with oil-water separators or product skimmers. Alternately, a groundwater injection/withdrawal system could be installed. This system could be used to add nutrients to the injection water to encourage biodegradation.

A system of individual small-diameter collector wells appears to be impractical. The thinness of the aquifer and high permeability would require that a number of closely spaced collector wells be installed. A relatively large quantity of groundwater would need to be pumped to create significant drawdown in the aquifer.

After free-product removal, elimination of contaminated soils could be performed through excavation or biodegradation. Excavated soils could be sent to the Cedar Hills Landfill or treated on site. Excavation of soils in the Terminal 91 area may be highly impractical because of the number of utility lines which cross the area, the loose nature of the soils, and the amount of traffic throughout the area.

In-place biodegradation of the product is also possible, if factors such as the high hydraulic conductivity of the soils (requiring injection and withdrawal french drains for gradient control), areal extent of contamination, and contamination above the normal water table elevation do not eliminate this method.

Extensive excavation of contaminated soils around the tank area is probably not worthwhile, as hydrocarbons will continue to migrate into the former tank site from upgradient sources. Similarly, in-place biodegradation for this tank site alone is not worthwhile because of the upgradient free product.

# 4.0 SUMMARY AND RECOMMENDATIONS

Hydrocarbons and other organic constituents are present in the vicinity of the former Tank 91N site at Terminal 91. Hydrocarbon contamination is not limited to the immediate vicinity of the Tank 91N site, as product has been detected in soils and on groundwater upgradient of the site. Soils in the immediate vicinity of the former tank site contain 1 to 8 percent hydrocarbons, however.

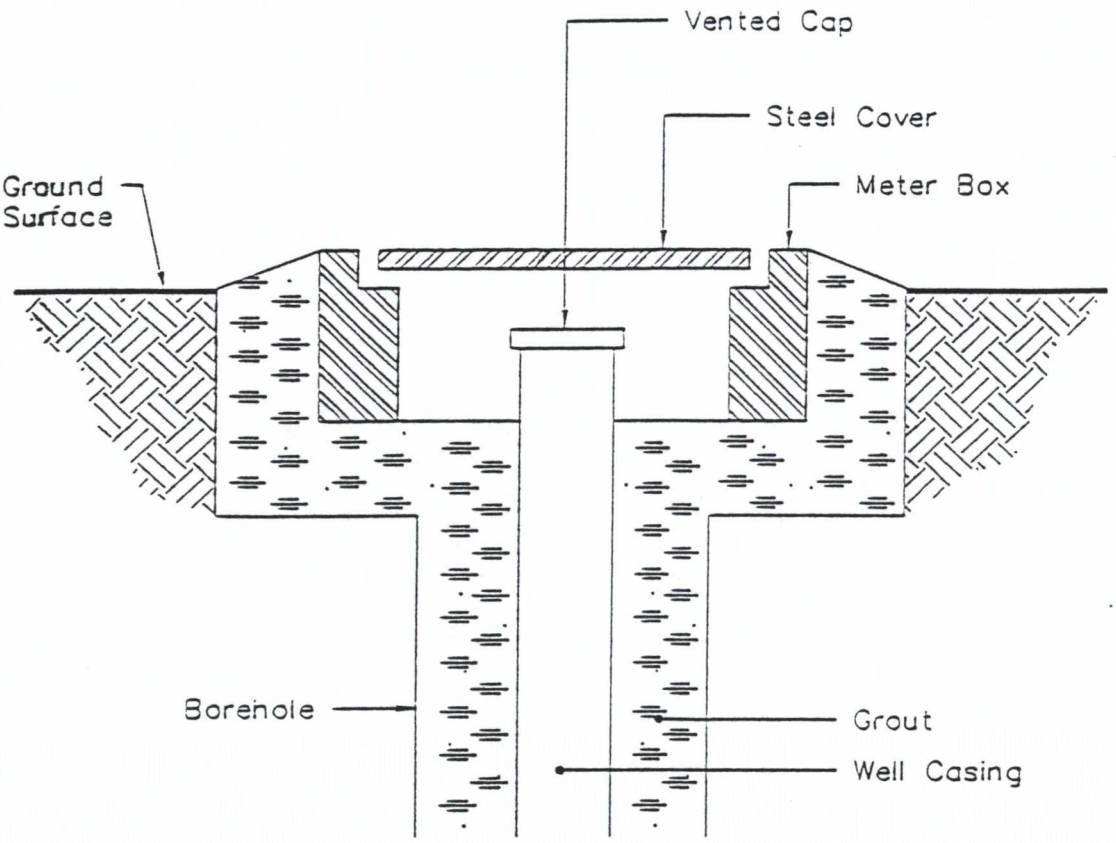
HLA suggests that an interim monitoring program should be undertaken. This monitoring would consist of water level measurements and product gauging of the three wells installed for this investigation, in conjunction with monitoring the wells installed around the Chempro facility.

Because free product is present in MW-39-2 and -3, remediation of the tank site alone is not warranted. It does not seem realistic to begin any site remediation method only in the vicinity of the former Tank 91N site.

Characterization of Terminal 91 further downgradient from both the Tank 91N and Chempro sites should also be performed. Additionally, high permeability backfill in utility trenches should be investigated to determine if contaminants are migrating along these possible pathways. Following this characterization, an appropriate method for remediation of Terminal 91 may be selected.

# APPENDIX A
# FIELD DATA

24\14124011\MIRROX




# WELLHEAD DETAIL

| | |
|---|---|
| | Bentonite–Cement Grout |
| | Blank PVC Casing |
| | Bentonite Seal |
| | Filter Sand |
| | Slotted PVC Casing |
| | Slough |

| | |
|---|---|
| | Bentonite Grout |
| | |
| | |
| | |
| | |

KEY TO WELL DETAIL (ON LOGS OF BORINGS)

PLATE

Harding Lawson Associates
Engineering and Environmental Services

WELLHEAD DETAIL
Port of Seattle
Seattle, Washington

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| HK - | 14124,011.09 | | 6/90 | | |

00488/C:

Top of Casing 16.65 ft

Equipment Mobile B-61 HSA

Elevation 17.28 ft Date 1/18/90


| Depth ft | Sample | Blows/ft | Core Rec. | HC Odor | OVM | |
|---|---|---|---|---|---|---|
| 0 | | | | | | 4-6" CONCRETE |
| | | | | | | BROWN SAND (SP) dry, loose, fine sand, with some coarse sand and fine gravel, trace of coarse gravel |
| | | 23 | 15 | No | | |
| 5 | | | | | | |
| | | 25 | 18 | No | | gray, wet, loose, fine to medium sand, no odor |
| 10 | | | | | | |
| | | 14 | 2 | No | | grades with fine gravel, wet, no odor |
| 15 | | | | | | |
| | | | | | | Boring terminated at 17.5 feet. Well completed on 1/18/90. |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |
| 40 | | | | | | |

MW-39-1 Coordinates
N 35003.2
E 20575.1

**Harding Lawson Associates**
Engineering and Environmental Services

# Log of Boring MW-39-1

(sheet 1 of 1) PLATE

Port of Seattle
Seattle, Washington

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| HK | 14124,011.09 | | 6/90 | | |

00488/C:

Top of Casing 16.84 ft

Equipment Mobile B-61 HSA

Elevation 17.63 ft Date 1/18/90


| Depth ft Sample | Blows/ft | Core Rec. | HC Odor | OVM | |
|---|---|---|---|---|---|
| 0 | | | | | CONCRETE |
| | | | | | DARK GRAY SAND (SP) dry, fine to medium sand, with some coarse sand and fine gravel, trace coarse gravel |
| | 43 | 2 | Yes | 2.0 | |
| | 31 | 12 | Yes | 63.0 | black, with free product, old product odor |
| 5 | | | | | |
| | 11 | 15 | Yes | 39.0 | gray, fine to coarse sand and fine gravel |
| | | | | | GRAY SILTY CLAY (ML-CL) saturated, with root fragments, HC odor, with free product |
| 10 | | | | | |
| | 18 | | Yes | 7.0 | DARK GRAY SAND (SP) fine to medium sand, with some silt and trace gravel |
| 15 | | | | | Boring completed at 15.0 feet on 1/18/90. Well completed on 1/18/90. |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |

MW-39-2 Coordinates
N 34998.2
E 20619.3

**Harding Lawson Associates**
Engineering and Environmental Services

# Log of Boring MW-39-2

(sheet 1 of 1) PLATE

Port of Seattle
Seattle, Washington

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| HK | 14124,011.09 | | 6/90 | | |

00488.C:

Top of Casing 17.35 ft

(See Plate ___ for Wellhead Construction)
Bentonite Seal
8" dia. Borehole
2" dia. Blank PVC Casing
Filter Sand (No. 2/16)
2" dia. Slotted PVC Casing (0.020" Slots)
Bottom Cap

| Depth ft | Sample | Blows/ft | Core Rec. | HC Odor | OVM | |
|---|---|---|---|---|---|---|
| 0 | | | | | | ASPHALT<br>DARK BROWN SAND (SP) dry, medium to coarse sand, with some fine to coarse gravel, no odor |
| | | 41 | 9 | No | | |
| 5 | | | | | | gray, wet, fine to medium sand, with shell fragments, some rounded gravel, product saturated |
| | | 36 | 12 | Yes | | moist, medium sand, with trace of coarse sand, product odor |
| 10 | | | | | | |
| | | 33 | 8 | Yes | | dark gray, wet, medium to coarse sand, with some fine to medium gravel, HC odor |
| 15 | | | | | | Boring terminated at 14.0 feet.<br>Well completed on 1/19/90. |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |
| 40 | | | | | | |

Equipment Mobile B-61 HSA

Elevation 17.77 ft Date 1/18/90

MW-39-3 Coordinates
N 35032.4
E 20648.0

Harding Lawson Associates
Engineering and Environmental Services

# Log of Boring MW-39-3

(sheet 1 of 1) PLATE

Port of Seattle
Seattle, Washington

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| HK | 14124,011.09 | | 6/90 | | |

Transmissivity Estimation Method
Based on Residual Drawdown in Bailed Well

| | | | |
|---|---|---|---|
| Well Number: | 39-1 | Site: Port of Seattle | |
| For One Bail Cycle or Pumping, Use The Following: | | | |
| Time Bailing Began: | 11hrs | 40min | sec |
| Time Bailing Stopped: | 11hrs | 50min | sec |
| Volume Bailed: | 28.00gallons | | |
| Static Water Level: | 4.23feet | | |
| Residual Water Level: | 4.38feet at | | |
| | 11hrs | 52min | sec |

| | | |
|---|---|---|
| Estimated Transmissivity: | 3056 | gallons per day per foot |
| | 409 | feet squared per day |
| Saturated Thickness: | 8.60feet | |
| Estimated Permeability: | 48 | feet per day |
| | 1.7e-2 | centimeters per second |

Reference: Skibitzke, H.E., 1963, USGS WSP 1536-I, p. 293-298

# Transmissivity Estimation Method
## Based on Residual Drawdown in Bailed Well

Well Number: 39-2 Site: Port of Seattle

For One Bail Cycle or Pumping, Use The Following:

| | | | |
|---|---|---|---|
| Time Bailing Began: | 10hrs | 43min | sec |
| Time Bailing Stopped: | 10hrs | 50min | sec |
| Volume Bailed: | 24.00gallons | | |
| Static Water Level: | 3.90feet | | |
| Residual Water Level: | 3.97feet at | | |
| | 10hrs | 52min | sec |

| | | |
|---|---|---|
| Estimated Transmissivity: | 7144 | gallons per day per foot |
| | 955 | feet squared per day |
| Saturated Thickness: | 10.08feet | |
| Estimated Permeability: | 95 | feet per day |
| | 3.3e-2 | centimeters per second |

Reference: Skibitzke, H.E., 1963, USGS WSP 1536-I, p. 293-298

# APPENDIX B
# LABORATORY DATA

Date of Report: February 9, 1990
Date Submitted: December 22, 1990
Project: 14124-011.09 Port of Seattle

**RESULTS OF ANALYSES OF SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS (C7-C32) BY MODIFIED EPA METHOD 8015**

| Sample I.D. | Matrix | Dilution Factor | TPH (ppm) | RANGE (C7-C32) |
|---|---|---|---|---|
| S-3-SE Cnr. Tank Bottom | Soil | 20 | 16,000 | C7-C24B |
| S-4-NW Cnr. Tank Bottom | Soil | 20 | 15,000 | C7-C24B |
| Quality Assurance | | | | |
| Method Blank | Soil | 1 | <1.0 | ---- |
| S-4-NW Cnr. Tank Bottom (Duplicate) | Soil | 20 | 14,000 | C7-C24B |
| S-4-NW Cnr. Tank Bottom (Matrix Spike) Spiked @ 1,000 ppm Percent Recovery | Soil | 20 | A | ---- |

A - The amount spiked was insufficient to give meaningful recovery data.

B - Indicative of Kerosene or diesel fuel.

enviros

Date of Report: February 9, 1990
Date Submitted: December 22, 1990
Project: 14124-011.09 Port of Seattle

**RESULTS OF ANALYSES OF ENVIRONMENTAL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS BY IR (EPA METHOD 418.1)**

| Sample # | Total Petroleum Hydrocarbons (ppm) |
|---|---|
| S-3-SE Cnr. Tank Bottom | 77,882 |
| S-4-NW Cnr. Tank Bottom | 28,544 |

a: Analysis performed by subcontract.

enviros

Date of Report: February 1, 1990
Date Submitted: January 17 & 25, 1990
Project: Job # 14124-011-09

## RESULTS OF ANALYSES OF SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS (C7-C32) BY MODIFIED EPA METHOD 8015

| Sample # | Matrix | Dilution Factor | TPH (ppm) | RANGE (C7-C32) |
|---|---|---|---|---|
| POS39-1-1 | soil | 1 | <1.0 | ---- |
| POS39-1-2 | soil | 1 | <1.0 | ---- |
| Boring 39-3-1 | soil | 1 | <1.0 | ---- |
| Boring 39-3-2 | soil | 1 | 1,300 | C7-C24A |
| POS39-2-1 | soil | 5 | 7,600 | C7-C24A |
| POS39-2-2 | soil | 5 | 3,500 | C7-C24A |
| **Quality Assurance** | | | | |
| Method Blank | | | <1.0 | ---- |
| POS39-1-1 (Duplicate) | | 1 | <1.0 | ---- |
| POS39-2-1 (Duplicate) | | 5 | 3,700 | C7-C24A |
| POS39-1-1 (Matrix Spike) Spiked @ 20 ppm Percent Recovery | | | 130% | C7-C32 |

A - Indicative of Diesel #2

enviros

Date of Report: February 1, 1990
Date Submitted: January 17 & 25, 1990
Project: Job # 14124-011-09

RESULTS OF ANALYSES OF ENVIRONMENTAL SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS
BY IR (EPA METHOD 418.1)

| Sample # | Total Petroleum Hydrocarbons (ppm) |
|---|---|
| POS39-2-1 | 28,454 |
| POS39-2-2 | 10,083 |

Quality Assurance:

| | |
|---|---|
| Method Blank | <5.0 |

a: Analysis performed by subcontract.

enviros

Sweet, Edwards & Associates, Inc.

# BORING LO(

**PROJECT** Chempro, Pier 91



**Location** See Figure 2.1

**Boring No.** HA-2

**Surface Elevation**

**Drilling Method** 3.25" stainless Stee Hand Auger

**Total Depth** 9.5'

**Drilled By** Sweet, Edwards/Arthur Lit

**Date Completed** 12/1/87

**Logged By** S. R. Henshaw

| WELL DETAILS | PENE-TRATION TIME/ RATE | DEPTH (FEET) | SAMPLE NO. | SAMPLE TYPE | PERME-ABILITY TESTING | SYMBOL | LITHOLOGIC DESCRIPTION | WATER QUALITY |
|---|---|---|---|---|---|---|---|---|
| Boring Abandoned with Bentonite Chips and Concrete | | 5 | | | | | 0-.75' CONCRETE APRON | |
| | | | | | | SP | .75-3.5' SAND, gray, medium grained, 10-20% shell fragments, 10-15% subrounded pebbles up to 4" in diam., oily layer at approximately 3.5', moist. | |
| | | 10 | | | | SP | 3.5-8.5' as above decrease in shell fragments and pebbles, saturated at 7'. | |
| | | | | | | | Terminated boring at 9.5' 12/1/87 | |

# LOG OF EXPLORATORY BORING

| | | | |
|---|---|---|---|
| PROJECT NAME | Chemical Processors | BORING NO. | TB-2 |
| LOCATION | Pier 91 | PAGE | 1 OF 2 |
| DRILLED BY | Tacoma Pump & Drill | REFERENCE ELEV. | 5.96' |
| DRILL METHOD | H.S.Auger | TOTAL DEPTH | 21.50' |
| LOGGED BY | S. Nelson | DATE COMPLETED | 12/21/88 |

| SAMPLE NUMBER | SAMPLE TYPE | BLOW COUNT (per six inches) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|
| | | | 0 - 0.6 foot: CONCRETE. (CON) |
| | | | 0.6 - 2.5 feet: GRAVELLY SAND; olive, fine to medium, 5-15% subround gravel to 2 inches in diameter, trace shells, dry, loose. Faint organic odor. (SW) (FILL) |
| 1 | 3" SS | 20-10-8 | 2.5 - 20.5 feet: SAND; olive-grey, fine to medium, 5-10% subround gravel to 1 inch in diameter, trace to 5% shell fragments. Dark petroleum saturated gravelly zone at 6.0-6.5 feet, 10-15% gravel to 1 inch in diameter. Coarse sand layer at 7.3 feet, petroleum saturated. Saturated below 5.7 feet. (SP) (FILL) |
| 2 | 3" SS | 3-3-9 | |
| 3 | 3" SS | 7-5-6 | |
| 4 | 2" SS | 3-5-8 | |
| 5 | 2" SS | 5-9-12 | --- @ 8.5 - 9.0 feet: SILTY SAND; dark olive-black, fine to coarse. |
| | | | --- @ 9.5 -10.5 feet: GRAVELLY SAND; olive, coarse, 25% subround to round gravel to 1/2 inch in diameter, trace silt, saturated with petroleum. |
| 6 | 3" SS | 18-32-50 | --- @ 16.0 - 16.3 feet: 10-15% subround gravel to 1 inch in diameter, petroleum odor decreasing. |

GROUND WATER LEVELS | DEPTH IN FT. | SAMPLES | LITHOLOGIC COLUMN | WELL DETAILS

5 10 15 20

REMARKS

1) Specific Location: Pit Separator. 2) H.S.Auger = Hollow Stem Auger. 3) SS = Split Spoon sample. 4) Water measurement at 5.66 feet BGS, at 9:40 on 12/21/88. See ADDITIONAL REMARKS in Description column.

# LOG OF EXPLORATORY BORING

| | | | |
|---|---|---|---|
| PROJECT NAME | Chemical Processors | BORING NO. | TB-2 |
| LOCATION | Pier 91 | PAGE | 2 OF 2 |
| DRILLED BY | Tacoma Pump & Drill | REFERENCE ELEV. | 5.96' |
| DRILL METHOD | H.S.Auger | TOTAL DEPTH | 21.50' |
| LOGGED BY | S. Nelson | DATE COMPLETED | 12/21/88 |

| SAMPLE NUMBER | SAMPLE TYPE | BLOW COUNT (per six inches) | GROUND WATER LEVELS | DEPTH IN FT. | SAMPLES | LITHO-LOGIC COLUMN | WELL DETAILS | LITHOLOGIC DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| 7 | | 18-16-14 | | 25 30 35 40 | | | | 20.5 - 21.5 feet: SILTY SAND; olive, very fine, trace shell and wood debris, petroleum odor, saturated. (SM)<br><br>Borehole terminated at 21.5 feet BGS on 12/21/88.<br>ADDITIONAL REMARKS: 5) Reference elevation at ground surface (Pavement). WELL DETAILS - Boring has been abandoned with bentonite chips and asphalt or concrete. |

REMARKS

1) Specific Location: Pit Separator. 2) H.S.Auger = Hollow Stem Auger. 3) SS = Split Spoon sample. 4) Water measurement at 5.66 feet BGS, at 9:40 on 12/21/88. See ADDITIONAL REMARKS in Description column.

Sweet, Edwards & Associates, Inc.

# BORING LOG

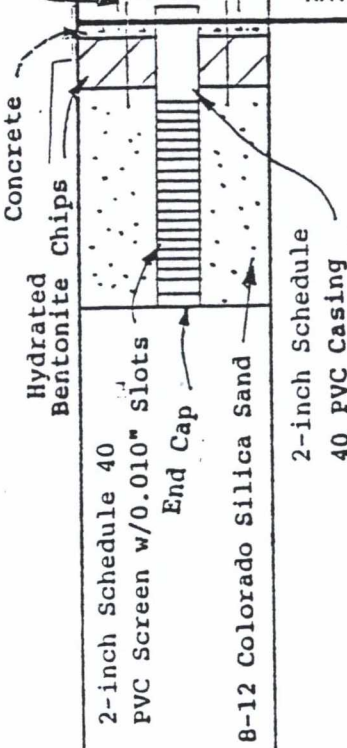
**PROJECT** Chempro, Pier 91 — Page 1 of 1

**Location** See Figure 2.1 — **Boring No.** CP-104-A

**Surface Elevation** — **Drilling Method** Mobil B-56 with 4.25" I.D. 7.5"O.D. Hollow Stem Auge

**Total Depth** 15' — **Drilled By** Tacoma Pump & Drilling

**Date Completed** 11/28/87 — **Logged By** S. R. Henshaw




| WELL DETAILS | PENETRATION TIME/ RATE | DEPTH (FEET) | SAMPLE NO. | SAMPLE TYPE | PERMEABILITY TESTING | SYMBOL | LITHOLOGIC DESCRIPTION | WATER QUALITY |
|---|---|---|---|---|---|---|---|---|
| | | | No | Sample | | SP | 0-10' SAND, medium grained, cuttings became wet at 6', gray. | |
| | | 10 | 101 -A | SPT | | GW | 10-12' GRAVELLY SAND, 10-20% subrounded gravel, less than 5% shell fragments, medium to coarse grained sand, gray, gravels are basalts, quartzite, metavolcanics, petroleum odor, saturated. | |
| | | | No | Sample | | | | |
| | | 20 | | | | SM | 12-15' SILTY SAND, 5-10% pebble size sand, 60% medium sand, 30% silt, gray, strong petroleum odor, sat. | |
| | | | | | | | Terminated boring at 15' 11/28/87 | |

SEA-300-02a

# LOG OF EXPLORATORY BORING

| | | | |
|---|---|---|---|
| PROJECT NAME | Chemical Processors | BORING NO. | CP-107 |
| LOCATION | Pier 91 | PAGE | 1 OF 1 |
| DRILLED BY | Tacoma Pump & Drill | REFERENCE ELEV. | 5.10' |
| DRILL METHOD | H.S.Auger | TOTAL DEPTH | 17.00' |
| LOGGED BY | S. Nelson | DATE COMPLETED | 12/29/88 |

| SAMPLE NUMBER | SAMPLE TYPE | BLOW COUNT (per six inches) | LITHOLOGIC DESCRIPTION |
|---|---|---|---|
| | | | 0 - 0.3 foot: ASPHALT. (AS) |
| | | | 0.3 - 2.0 feet: GRAVELLY SAND; light to dark brown, fine to medium, 25% subangular gravel to 3 inches in diameter, 0-5% silt, dry, compact. (SW) (FILL) |
| 1 | 3" SS | 29-49-25 | 2.0 - 3.6 feet: SAND; light olive, fine to medium, 10% subround gravel to 2 inches in diameter, 10% shell debris, dry. (SP) (FILL) |
| 2 | 3" SS | 16-21-25 | |
| 3 | 3" SS | 8-13-18 | 3.6 - 12.0 feet: GRAVELLY SAND; light to medium olive, fine to medium, 20-30% subround gravel to 2 inches in diameter. 0-5% shell debris. Saturated, with oily odor below 6.0 feet. Some silt and coarse sand layers below 6.0 feet. (SW) (FILL) |
| 4 | 3" SS | 7-10-13 | |
| 5 | | 7-10-11 | |
| | | | 12.0 - 15.8 feet: SAND; dark olive, medium to coarse, 5% subround gravel to 1 inch in diameter, trace shells. Petroleum odor, saturated. (SP) (FILL) |
| 6 | 3" SS | 7-14-16 | |
| | | | 15.8 - 16.5 feet: SILTY SAND; olive, 20-50% silt, fine to coarse sand; organic decay odor, saturated. (SM) |
| | | | Borehole terminated at 17.0 feet BGS on 12/29/88. |

REMARKS

1) Specific Location: NC Warehouse. 2) H.S.Auger = Hollow Stem Auger. 3) SS = Split Spoon sample. 4) Water measurement at 6.0 feet BGS, at 11:00 on 12/29/88. 5)Reference elevation at top of PVC casing, City of Seattle datum.

BURLINGTON ENVIRONMENTAL

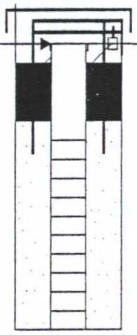
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Consulting Firm: Burlington | | | Date(s):10/10/92 – 10/10/92 | | | | |
| Drilling Contractor: Burlington | | | Elevation: [redacted] | | | | |
| Drilling Method: Hollow Stem Auger | | | Datum: City of Seattle Datum | | | | |
| Location: Pier 91 | Logged By: James Peale | | Approved By: | | | | |
| | Surface Casing: 0.00in N/A | | From | 0.0 | to | 0.0 | ft |
| Identification: CP–112 | Well Casing: 2.00in PVC | | From | 0.0 | to | 5.0 | ft |
| State Permit # 046927 Permit Date: 09/08/92 | Sand Pack: 10–20 Silica | | From | 4.0 | to | 15.0 | ft |
| Remarks: Specific Location: North of Whse 39<br>Reference Elevation: Top of Casing | Slot Size: 0.010in | | From | 5.0 | to | 15.0 | ft |
| | Seal Type: | No. 1 Grout | From | 0.0 | to | 1.0 | ft |
| | | No. 2 Bentonite | From | 1.0 | to | 4.0 | ft |

[redacted]

| DEPTH (feet) | SAMPLE (REC %) | SAMPLE NO. | GRAPHIC LOG | Material Description |
|---|---|---|---|---|
| 0 | | | | CONCRETE (CR) |
| | | 2–4 | | SAND (SP), dark brown, fine– to medium–grained, trace coarse gravel, slightly damp. |
| | | 4–6 | | SAND (SM), dark gray brown, fine– to medium–grained, some fine gravel, some silt, slightly damp, nonplastic. |
| –5.00 | | 6–8 | | SILTY CLAYEY SAND (SM–SC), dark gray, fine–grained, some clay, some silt, wet, medium plastic. |
| | | 8–10 | | SILT (MH), dark gray, black laminations, wet, medium–highly plastic. |
| 10 | | 10–12 | | SANDY GRAVEL (GP), dark gray, fine gravel, fine–grained sand, wet. |
| | | 12–14 | | GRAVELLY SAND (SW), dark gray, fine– to coarse–grained, fine gravel. |
| –15.00 | | 14–16 | | SILT (ML), dark gray, trace fine–grained sand, slightly plastic. |
| | | | | TD = 16.00 feet |
| 20 | | | | |
| –25.00 | | | | |
| 30 | | | | |
| –35.00 | | | | |
| 40 | | | | |
| –45.00 | | | | |
| 50 | | | | |
| –55.00 | | | | |
| 60 | | | | |

Well Construction

[redacted]



CD=15.00

File Name: Water1.wr1
Revised: April 20,1988 LMS

Table 3.3. Summary of Groundwater Testing Results - Organics and Metals
Pier 91, Chemical Processors, Inc., Seattle, Washington



| Well Number: | MA-1 | MA-2 | CP-104-A | CP-103-A | CP-103-B | B-101 | CP-106-A | CP-106-A Dup. | Station 10 | CP-105-B | CP-105-B Dup. | CP-105-A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date: | 12/01/87 | 12/01/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/01/87 | 12/01/87 | 12/01/87 |
| Description: | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr |
| Sample Code: | C91-12187-1 | MA-2 | CP 12487-A | CP 12487-B | CP 12487-C | CP 12487-D | CP 12487-F | CP 12487-G | CP 12487-H City of Seattle Well | C91-12187-3 | C91-12187-2 | C91-12187-5 |
| **Volatiles (ug/L)** | | | | | | | | | | | | |
| Vinyl Chloride | ‡ | NA | 19 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Chloroethane | ‡ | NA | 20 | ‡ | ‡ | 8.4 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Chloroform | ‡ | NA | ‡ | 2.7 | 8.4 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Trichloroethene | ‡ | NA | ‡ | ‡ | ‡ | 2.3 | 3.3 | ‡ | ‡ | ‡ | ‡ | ‡ |
| 1,1-Dichloroethane | ‡ | NA | 70 | ‡ | ‡ | 7.8 | 4.4 | 4.4 | ‡ | ‡ | ‡ | ‡ |
| trans-1,2-Dichloroethene | ‡ | NA | 3.6 | ‡ | ‡ | ‡ | 3.0 | 3.1 | ‡ | ‡ | ‡ | ‡ |
| 1,1,1-trichloroethane | ‡ | NA | 2.1 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Acetone | ‡ | NA | 160 | ‡ | 2100 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| 2-Butanone | ‡ | NA | 15 | ‡ | 82 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Benzene | ‡ | NA | 7.2 | ‡ | ‡ | 4.9 | ‡ | ‡ | 17 | ‡ | ‡ | ‡ |
| Toluene | ‡ | NA | 10 | ‡ | ‡ | 2.3 | ‡ | 2.1 | 5.2 | ‡ | ‡ | ‡ |
| Ethyl Benzene | ‡ | NA | 2.4 | ‡ | ‡ | ‡ | ‡ | ‡ | 10 | ‡ | ‡ | ‡ |
| Total Xylenes | ‡ | NA | 12 | ‡ | ‡ | 9.4 | ‡ | ‡ | 2.5 | ‡ | ‡ | ‡ |
| **Base/Neutrals/Acids (ug/L)** | | | | | | | | | | | | |
| Acenaphthene | ‡ | ‡ | 24 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Fluorene | ‡ | 1300 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Phenanthrene | ‡ | 1800 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | 20 | ‡ | ‡ | ‡ |
| Napthalene | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| 2-Methylnapthalene | ‡ | 3400 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Bis(2-ethlyhexyl)phthalate | 48 | 4900 | ‡ | 20 | ‡ | ‡ | 150 | 150 | ‡ | ‡ | ‡ | ‡ |
| **Pesticides and PCBs (ug/L)** | | | | | | | | | | | | |
| alpha-BHC | ‡ | 0.3 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Aroclor-1250 | ‡ | 19 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| **Cyanides (ug/L)** | | | | | | | | | | | | |
| | ‡(b) | NA | 0.10 | ‡ | 0.09 | 0.02 | ‡ | ‡ | ‡ | ‡(b) | ‡(b) | 0.035(b) |

Table 3.3. Summary of Groundwater Testing Results - Organics and Metals
Pier 91, Chemical Processors, Inc., Seattle, Washington



| Well Number: | HA-1 | HA-2 | CP-104-A | CP-103-A | CP-103-B | B-101 | CP-106-A | CP-106-A Dup. | Station 10 | CP-105-B | CP-105-B Dup. | CP-105-A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date: | 12/01/87 | 12/01/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/01/87 | 12/01/87 | 12/01/87 |
| Description: | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr |
| Sample Code: | C91-12187-1 | HA-2 | CP 12487-A | CP 12487-B | CP 12487-C | CP 12487-D | CP 12487-F | CP 12487-G | CP 12487-H City of | C91-12187-3 | C91-12187-2 | C91-12187-5 |
| **Petroleum Hydrocarbons (mg/L)** | | | | | | | | | | | | |
| Weathered Fuel Oil No.2 | 2300 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| **Total Metals (mg/L)** | | | | | | | | | | | | |
| Arsenic | 0.048 | NA | 0.017 | 0.012 | ‡ | ‡ | 0.012 | 0.013 | ‡ | ‡ | ‡ | 0.004 |
| Cadmium | 0.016 | NA | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | 0.005 |
| Chromium | 0.1 | NA | 0.09 | 0.011 | ‡ | ‡ | 0.07 | 0.08 | ‡ | ‡ | ‡ | ‡ |
| Copper | 0.39 | NA | 0.1 | 0.037 | ‡ | ‡ | 0.051 | 0.065 | ‡ | ‡ | ‡ | 0.007 |
| Lead | 0.91 | NA | 0.042 | 0.037 | ‡ | 0.003 | 0.034 | 0.047 | ‡ | ‡ | ‡ | ‡ |
| Mercury | 0.0011 | NA | 0.0002 | 0.0002 | ‡ | ‡ | 0.0001 | 0.0002 | 0.0001 | ‡ | ‡ | ‡ |
| Nickel | 0.18 | NA | 0.14 | ‡ | 0.04 | ‡ | 0.09 | 0.12 | ‡ | ‡ | ‡ | ‡ |
| Zinc | 1.5 | NA | 0.12 | 0.02 | ‡ | ‡ | 0.1 | 0.13 | ‡ | ‡ | ‡ | ‡ |
| **Dissolved Metals-Filtered (mg/L)** | | | | | | | | | | | | |
| Copper | NA | NA | ‡ | 0.009 | ‡ | ‡ | ‡ | ‡ | ‡ | NA | NA | NA |

Comments:

1. Analytes are not shown on summary table when not detected at any sampling points.
2. All values reported are greater than minimum detection level.
3. (‡) Analyte not detected, or detected below minimum detection level.
4. (NA) Analyte not analyzed.
5. Sampling Dates: Monitoring well borings (soils): December 1-4, 1987.
6. Sample analysis performed by Erco Laboratories.
7. Station 10 is located adjacent to B-102. B-102 could not be located and is assumed destroyed.
8. (b) Laboratory data not available. Values shown were obtained from summary sheets in the A.D. Little Draft Report: Pier 91 Facility Analytical Data, February 18,1988, Appendix F.

Table 1. Pier 91 Groundwater Data

17-Feb-89
PIER 91 FIELD SAMPLE DATA

PIER 91 SITE
Sample Period: 12-87

Not within limits: *
Trace: #

| Well Number: | HA-1 | HA-2 | CP 105.5 | CP 104 | CP 103-A | CP 103-B | B-101 | CP 106 | CP 106 | CP 106 | CP 106 | ?ID B-102 | 105-B | 105-A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date: | 12/01/87 | 12/01/87 | 12/01/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | | | 12/04/87 | 12/01/87 | 12/01/87 |
| Description: | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | | | Gdwtr | Gdwtr | Gdwtr |
| Sample Code: | C91-12187-1 | | C91-12187-2 | CP 12487-A | CP 12487-BCP | 12487-C | CP 12487-D | CP 12487-F | CP 12487-G Field Duplicate | CP12387F Lab Duplicate | | CP 12487-H Station 10 City of Seattle Well | C91-12187-3 | C91-12187-5 |
| Phthalates | | Anthracene, Fluoranthene, Pyrene, Chrysene | | | | | | | | | | | | |
| bis(2-Ethylhexyl)phthalate | 48 | 4900 | <20 * | <20 * | 20 | <20 * | <20 * | 150 | <20 * | <40 * | | <20 * | <20 * | <20 |
| Di-n-butyl phthalate | <40 | <800 | <20 | <20 | <20 | <20 | <20 | <20 | <20 | <40 | | <20 | <20 | <20 |
| Phenols | | | | | | | | | | | | | | |
| 4-Methylphenol | <40 | <800 | <20 | <20 * | <20 | <20 | <20 | <20 | <20 | <40 | | <20 | <20 | <20 |
| Semivolatile Unknowns | Present | Present | Present | Present | Present | Present | Present | Present | Present | | | Present | Present | ND |
| Semivolatile Surrogates | | | | | | | | | | | | | | |
| 2-Fluorophenol 21-100 | 59 | | 58 | 48 | 67 | 49 | 54 | 49 | 66 | 94 | | 71 | 59 | 29 |
| d5-Phenol 10-94 | 52 | | 59 | 30 | 49 | 39 | 50 | 37 | 43 | 77 | | 54 | 46 | 38 |
| 2,4,6-Tribromophenol 10-123 | 66 | | 64 | 50 | 80 | 63 | 77 | 67 | 77 | 89 | | 84 | 66 | 52 |
| d5-Nitrobenzene 35-114 | 72 | | 66 | 51 | 86 | 60 | 88 | 63 | 89 | 109 | | 87 | 77 | 60 |
| 2-Fluorobiphenyl 43-116 | 60 | | 62 | 49 | 77 | 57 | 81 | 57 | 81 | 92 | | 79 | 67 | 63 |
| d14-p-Terphenyl 33-141 | 69 | | 74 | 48 | 74 | 54 | 92 | 59 | 90 | 94 | | 90 | 74 | 58 |
| Pesticides and PCBs, ug/L | ND | | ND | ND | ND | ND | ND | ND | ND | ND | | ND | ND | ND |
| alpha-BHC | | 0.3 | | | | | | | | | | | | |
| Aroclor-1260 | | 19 | | | | | | | | | | | | |
| Cyanides, mg/L | <0.010 | | <0.010 | 0.10 | <0.02 | 0.09 | 0.02 | <0.02 | <0.02 | | | <0.02 | <0.010 | 0.083 |
| Petroleum Hydrocarbons, mg/L | 2300 Weathered Fuel Oil No. 2 | | | | | | | | | | | | | |
| Total Metals, mg/L | | | | | | | | | | | | | | |
| Arsenic | 0.048 | | <0.003 | 0.017 | 0.012 | <0.003 | <0.003 | 0.012 | 0.013 | <.03 | | <0.003 | <0.003 | 0.004 |
| Cadmium | 0.016 | | <0.03 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | | <0.005 | <0.03 | 0.005 |
| Chromium | 0.1 | | <0.05 | 0.09 | 0.011 | <0.01 | <0.01 | 0.07 | 0.08 | 0.09 | | <0.01 | <0.05 | <0.01 |
| Copper | 0.39 | | <0.03 | 0.1 | 0.037 | <0.006 | <0.006 | 0.051 | 0.065 | 0.052 | | <0.006 | <0.03 | 0.007 |
| Lead | 0.91 | | <0.006 | 0.042 | 0.037 | <0.002 | 0.003 | 0.034 | 0.047 | 0.06 | | <0.002 | <0.02 | <0.008 |
| Mercury | 0.0011 | | <0.0001 | 0.0002 | 0.0002 | <0.0001 | <0.0001 | 0.0001 | 0.0002 | <.0004 | | 0.0001 | <0.0001 | <0.0001 |
| Nickel | 0.18 | | <0.2 | 0.14 | <0.04 | 0.04 | <0.04 | 0.09 | 0.12 | 0.08 | | <0.04 | <0.2 | <0.04 |

Table 1. Pier 91 Groundwater Data

17-Feb-88
PIER 91 FIELD SAMPLE DATA

PIER 91 SITE
Sample Period: 12-87

Not within limits: *
Trace: #

| Well Number: | MA-1 | MA-2 | CP 105.5 | CP 104 | CP 105-A | CP 103-B | B-101 | CP 106 | CP 106 | CP 106 | CP 102 | 105-B | 105-A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date: | 12/01/87 | 12/01/87 | 12/01/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | | 12/04/87 | 12/01/87 | 12/01/87 |
| Description: | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr Field Duplicate | Lab Duplicate | Gdwtr Station 18 City of Seattle Well | Gdwtr | Gdwtr |
| Sample Code: | C91-12187-1 | | C91-12187-2 | CP 12487-A | CP 12487-BCP | 12487-C | CP 12487-D | CP 12487-F | CP 12487-G | CP12387F | CP 12487-H | C91-12187-3 | C91-12187-5 |
| **Chlorinated** | | | | | | | | | | | | | |
| Vinyl chloride | <5 | | <5 | 19 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| Chloroethane | <5 | | <5 | 20 | <5 | <5 | 8.4 | <5 | <5 | <5 | <5 | <5 | <5 |
| Chloroform | <2 | | <2 | <2 | 2.7 | 8.4 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| Trichloroethene | <2 | | <2 | <2 | <2 | <2 | <2 | 2.3 | 3.3 | 2.7 | <2 | <2 | <2 |
| 1,1-Dichloroethane | <2 | | <2 | 70 | <2 | <2 | 7.8 | 4.4 | 4.4 | 4.6 | <2 | <2 | <2 |
| trans-1,2-Dichloroethene | <2 | | <2 | 3.6 | <2 | <2 | <2 | 3.0 | 3.1 | 3.1 | <2 | <2 | <2 |
| 1,1,1-trichloroethane | <2 | | <2 | 2.1 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| **Non-chlorinated** | | | | | | | | | | | | | |
| Acetone | <50 | | <50 | 160 | <50 | 2100 | <50 | <50 | <50 | <50 | <50 | <50 | <50 |
| 2-Butanone | <10 | | <10 | 15 | <10 | 82 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| **Aromatics** | | | | | | | | | | | | | |
| Benzene | <2 | | <2 | 7.2 | <2 | <2 | 4.9 | <2 | <2 | <2 | 17 | <2 | <2 |
| Toluene | <2 | | <2 | 10 | <2 | <2 | 2.3 | <2 | 2.1 | <2 | 5.2 | <2 | <2 |
| Ethyl benzene | <2 | | <2 | 2.4 | <2 | <2 | <2 | <2 | <2 | <2 | 10 | <2 | <2 |
| Total xylenes | <2 | | <2 | 12 | <2 | <2 | 9.4 | <2 | <2 | <2 | 2.5 | <2 | <2 |
| Volatile Unknowns | Present | | ND | Present | ND | Present | Present | Present | Present | NA | Present | ND | ND |
| **Volatile Surrogates** | Limits | | | | | | | | | | | | |
| d4-1,2-Dichloroethane | 76-114 | 101 | 98 | 94 | 100 | 103 | 103 | 102 | 99 | 100 | 98 | 98 | 96 |
| d8-Toluene | 88-110 | 102 | 103 | 100 | 102 | 101 | 101 | 103 | 99 | 101 | 102 | 102 | 99 |
| p-Bromofluorobenzene | 86-115 | 119 * | 109 | 115 | 103 | 104 | 100 | 100 | 122 | 108 | 99 | 100 | 103 |
| **Semi-volatile Organics, ug/L** | | | | | | | | | | | | | |
| **PAH** | | | | | | | | | | | | | |
| Acenaphthene | | <40 | <800 | <20 | 24 | <20 | <20 | <20 | <20 * | <20 * | <40 | <20 * | <20 | <20 |
| Dibenzofuran | | <40 | <800 | <20 | <20 * | <20 | <20 | <20 | <20 | <20 * | <40 | <20 * | <20 | <20 |
| Fluorene | | <40 | 1300 | <20 | <20 * | <20 | <20 | <20 * | <20 * | <20 * | <40 | <20 * | <20 | <20 |
| Phenanthrene | | <40 * | 1800 | <20 | <20 * | <20 | <20 | <20 | <20 | <20 | <40 | 20 | <20 | <20 |
| Naphthalene | | <40 | <800 | <20 | <20 | <20 | <20 | <20 * | <20 | <20 | <40 | <20 * | <20 | <20 |
| 2-Methylnaphthalene | | <40 | 3400 | <20 | <20 | <20 | <20 | <20 * | <20 | <20 | <40 | | | |

Trace levels of

Table 3-12 Summary of Semi-Volatile Organic Compounds in Ground Water (ug/l)- Round 2
Pier 91 Facility, Chemical Processors, Inc., Seattle, WA

| SAMPLE NAME | CP-103-A | CP-103-B | CP-104-A | CP-104-B | CP-105-A | CP-105-B | CP-106 | CP-107 | CP-108-A | CP-108-B | CP-109 | CP-110 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PHENOL | | | 8 | | | | | | | | | |
| 2-METHYLPHENOL | | | 4 | | | | | | | | | |
| 4-METHYLPHENOL | 380 | | 36 | | | | | | | | 2 | |
| 2-4-DIMETHYLPHENOL | | | 14 | | | | | | | | | |
| NAPTHALENE | | | 22 | | | | | | | | 6 | |
| 2-METHYLNAPTHALENE | | | 18 | | 14 | | | 1600 | 2 | | 120 | 130 |
| ACENAPTHENE | | | 66 | | | | | 78 | | | 5 | 12 |
| DIBENZOFURAN | | | 26 | | | | | 230 | 3 | | 7 | |
| DIETHYLPHTALATE | | | 7 | | | | | | | | | |
| FLUORENE | | | 30 | | | | | 430 | 2 | | 13 | 50 |
| PHENANTHRENE | | | 14 | | 5 | | | 600 | 2 | | 18 | 63 |
| ANTHRACENE | | | 2 | | | | | 23 | | | | 4 |
| FLUORANTHENE | | | | | | | | 79 | 3 | | 3 | 9 |
| PYRENE | | | | | | | | 58 | 2 | | | 9 |
| BUTYLBENZYLPHTHALATE | | | | | | | | | | | | 7 |
| BENZO(A)ANTHRACENE | | | | | | | | 20 | 2 | | 2 | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 90 | 19 | 240 | 72 | 9 | | | 1200 | 9 | 9 | 8 | 95 |
| CHRYSENE | | | | | | | | 24 | 2 | | | 8 |
| DI-N-OCTYL PHTHALATE | 12 | | 10 | 3 | | | | 40 | | 1 | | |
| BENZO(B)&(K)FLUORANTHENE | | | | | | | | 22 | 3 | | | |
| BENZO(A)PYRENE | | | | | | | | | 1 | | | |
| INDENO(1,2,3-CD)PYRENE | | | | | | | | | 2 | | | |
| DIBENZ(A,H)ANTHRACENE | | | | | | | | | 1 | | | |
| BENZO(GHI)PERYLENE | | | | | | | | | 2 | | | |

COMMENTS:
* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Compounds not detected in any samples are excluded from table.
* Samples collected on 3/8/89.
* Chemical testing by ARI, Seattle, WA.

Table 3-9

Summary of Volatile Organic Compounds in Ground Water (ug/l) - T-Borings and Round 1
Pier 91 Facility, Chemical Processors, Inc., Seattle, WA

| SAMPLE NAME | CP-103-A | CP-103-B | CP-104-A | CP-104-B | CP-105-A | CP-105-B | CP-106 | CP-107 | CP-108-A | CP-108-B | CP-109 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VINYL CHLORIDE | | | 25 | | | | | 4.3 | | | |
| CHLOROETHANE | 5.4 | 15 | 21 | | | | | 110 | 7.7 | | 76 |
| METHYLENE CHLORIDE | | | 6.8 | | 4.1 | | | | | | |
| ACETONE | 41 | 28 | 200 | 19 | | | | | 21 | | 210 |
| 1,1-DICHLOROETHENE | | | | | | | | 3.3 | | | |
| 1,1-DICHLOROETHANE | 0.9 | 2.3 | 41 | 0.9 | | | 5.4 | 3.6 | 3.1 | | 3.4 |
| 1,2-DICHLOROETHENE (TOTAL) | | | 9.9 | | | | 3.3 | 2.4 | | | 1.2 |
| CHLOROFORM | | | | 0.3 | | | | | 5.8 | | |
| 1,2-DICHLOROETHANE | | | | | | | | | | | |
| 2-BUTANONE | | | 30 | | | | | | | | |
| TRANS-1,2-DICHLOROETHENE | | | | | | | | | | | |
| CIS-1,2-DICHLOROETHENE | | | | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | | | 4.2 | | | | | | | | |
| 1,1,2-TRICHLORO-1,2,2-TRIFLUROETHANE | | | 16 | | | | | | | | |
| TRICHLOROETHENE | | | 1.6 | | | | 3.7 | | | | |
| BENZENE | 4.9 | 12 | 8.3 | | | | | 1.1 | 18 | 1.4 | 35 |
| 2-METHYL-2-PENTANONE | | | | | | | | | | | |
| TETRACHLOROETHENE | | | | | | | 1.3 | | | | |
| TOLUENE | 7.2 | 6.3 | 21 | | 0.2 | 0.6 | 1.3 | | 7.6 | 2.2 | 5.1 |
| ETHYLBENZENE | | | 7.9 | 0.6 | | | | | 0.7 | | |
| TOTAL XYLENE | 2.4 | 4.3 | 24 | 1 | 0.6 | 0.5 | | 6 | 2.1 | | 27 |

Comments:

* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Compounds not detected in any samples are excluded from table.
* Duplicate samples were averaged.
* Samples collected from 12/88 to 2/89.
* Chemical testing by ARI, Seattle, WA.

Table 3-10 Summary of Volatile Organic Compounds in Ground Water (ug/l) - Round 2

Pier 91, Chemical Processors, Inc., Seattle, WA

| SAMPLE NAME | CP-103-A | CP-103-B | CP-104-A | CP-104-B | CP-105-A | CP-105-B | CP-106 | CP-107 | CP-108-A | CP-108-B | CP-109 | CP-110 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VINYL CHLORIDE | | | 27 | | | | 2.9 | 4.7 | | | | 1.9 |
| CHLOROETHANE | | | 24 | | | | | 128 | | | 150 | 71 |
| METHYLENE CHLORIDE | 21 | 1.2 | 4.5 | 1.5 | | 0.5 | 1.7 | 0.7 | 4.0 | 3.6 | 1.5 | |
| ACETONE | | | 20 | | | 8.8 | 16 | 20 | | | | |
| CARBON DISULFIDE | 2.2 | | | | | | | | | | | |
| 1,1-DICHLOROETHENE | | | | | | | | | 0.9 | | | |
| 1,1-DICHLOROETHANE | | | 46 | | | | 7.4 | 3.8 | | | 3.7 | |
| CIS-1,2-DICHLOROETHENE | | | 18 | | | | | | | | | |
| 1,2-DICHLOROETHENE (TOTAL) | | | | | | | 6.9 | 3.5 | | | | 2.0 |
| CHLOROFORM | 85 | | | | | | | | 1.7 | | | |
| 2-BUTANONE | | | 1.7 | | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | | | 3.8 | | | | | | | | | |
| 1,1,2-TRICHLORO-1,2,2-TRIFLUROETHANE | | | | | | | 1.6 | | | | | |
| TRICHLOROETHENE | | | 3.6 | | | | 2.1 | | | | | |
| BENZENE | | | 5.9 | | | | 1.0 | 7.9 | 5.0 | | 34 | 15 |
| TOLUENE | 5.4 | | 20 | 1.1 | | | | 1.1 | 1.6 | | 8.3 | 2.0 |
| ETHYLBENZENE | | | 5.5 | | | | | | | | | |
| TOTAL XYLENES | | | 20 | | | | | 4.9 | 1.6 | 1.1 | 5.9 | 1.5 |

COMMENTS:

* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Compounds not detected in any samples are excluded from table.
* Samples collected on 3/8/89.
* Chemical testing by ARI, Seattle, WA.

Table 3-11 Summary of Semi-Volatile Organic Compounds in Ground Water (ug/l) - T-Borings and Round 1
Pier 91 Facility, Chemical Processors, Inc., Seattle, WA

| SAMPLE NAME | CP-103-A | CP-103-B | CP-104-A | CP-104-B | CP-105-A | CP-105-B | CP-106 | CP-107 | CP-108-A | CP-108-B | CP-109 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PHENOL | | | 2 | | | 1 | | | | | |
| 2-METHYLPHENOL | | | 3 | | | 0.5 | | | | | |
| 4-METHYLPHENOL | | | 26 | | | 0.5 | | | | | |
| 2,4-DIMETHYLPHENOL | | | 7 | | | | | | | | |
| NAPTHALENE | | | 11 | | | | | | 3 | | |
| 4-CHLORO-3-METHYLPHENOL | 10 | 12 | | | | | | | | | |
| 2-METHYLNAPTHALENE | 1 | 2 | 10 | 57 | | | | 450 | 5.6 | | 160 |
| ACENAPHTHYLENE | | | | | | | | 45 | | | |
| ACENAPTHENE | | | 26 | | | | | 40 | 1.3 | | |
| 4-NITROPHENOL | | | | | | | | | | | |
| DIBENZOFURAN | | | 12 | | | | | 29 | 3.6 | | |
| FLUORENE | | | 12 | 10 | | | | 130 | 3.8 | | 19 |
| PHENANTHRENE | | | 4 | 15 | | | | 200 | 2.3 | | 26 |
| ANTHRACENE | | | | | | | | | | | |
| FLUORANTHENE | | | | | | | | | 1.3 | | |
| PYRENE | | | | | | | | | | | |
| BENZO(A)ANTHRACENE | | | | | | | | | | | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 3 | 3 | 4 | 97 | 8 | 5 | 4.3 | 340 | 21 | 15 | 16 |
| DIETHYLPHTHALATE | | | | | | | 1.7 | | | | |
| CHRYSENE | | | | | | | | | | | |
| DI-N-OCTYL PHTHALATE | | | | | | | 1 | | 1.3 | | |
| BENZO(K)FLUORANTHENE | | | | | | | | | | | |
| BENZO(A)PYRENE | | | | | | | | | | | |
| INDENO(1,2,3-CD)PYRENE | | | | | | | | | | | |
| DIBENZO(A,H)ANTHRACENE | | | | | | | | | | | |
| BENZO(GHI)PERYLENE | | | | | | | | | | | |

Comments on Page 2

File Name: Water1.wr1
Revised: April 20,1988 LMS

Table 3.3. Summary of Groundwater Testing Results - Organics and Metals
Pier 91, Chemical Processors, Inc., Seattle, Washington



| Well Number: | MA-1 | MA-2 | CP-104-A | CP-103-A | CP-103-B | B-101 | CP-106-A | CP-106-A Dup. | Station 10 | CP-105-B | CP-105-B Dup. | CP-105-A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date: | 12/01/87 | 12/01/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/04/87 | 12/01/87 | 12/01/87 | 12/01/87 |
| Description: | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr | Gdwtr |
| Sample Code: | C91-12187-1 | MA-2 | CP 12487-A | CP 12487-B | CP 12487-C | CP 12487-D | CP 12487-F | CP 12487-G | CP 12487-H City of Seattle Well | C91-12187-3 | C91-12187-2 | C91-12187-5 |
| **Volatiles (ug/L)** | | | | | | | | | | | | |
| Vinyl Chloride | ‡ | NA | 19 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Chloroethane | ‡ | NA | 20 | ‡ | ‡ | 8.4 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Chloroform | ‡ | NA | ‡ | 2.7 | 8.4 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Trichloroethene | ‡ | NA | ‡ | ‡ | ‡ | 2.3 | 3.3 | ‡ | ‡ | ‡ | ‡ | ‡ |
| 1,1-Dichloroethane | ‡ | NA | 70 | ‡ | ‡ | 7.8 | 4.4 | 4.4 | ‡ | ‡ | ‡ | ‡ |
| trans-1,2-Dichloroethene | ‡ | NA | 3.6 | ‡ | ‡ | ‡ | 3.0 | 3.1 | ‡ | ‡ | ‡ | ‡ |
| 1,1,1-trichloroethane | ‡ | NA | 2.1 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Acetone | ‡ | NA | 160 | ‡ | 2100 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| 2-Butanone | ‡ | NA | 15 | ‡ | 82 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Benzene | ‡ | NA | 7.2 | ‡ | ‡ | 4.9 | ‡ | ‡ | 17 | ‡ | ‡ | ‡ |
| Toluene | ‡ | NA | 10 | ‡ | ‡ | 2.3 | ‡ | 2.1 | 5.2 | ‡ | ‡ | ‡ |
| Ethyl Benzene | ‡ | NA | 2.4 | ‡ | ‡ | ‡ | ‡ | ‡ | 10 | ‡ | ‡ | ‡ |
| Total Xylenes | ‡ | NA | 12 | ‡ | ‡ | 9.4 | ‡ | ‡ | 2.5 | ‡ | ‡ | ‡ |
| **Base/Neutrals/Acids (ug/L)** | | | | | | | | | | | | |
| Acenaphthene | ‡ | ‡ | 24 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Fluorene | ‡ | 1300 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Phenanthrene | ‡ | 1800 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Napthalene | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | 20 | ‡ | ‡ | ‡ |
| 2-Methylnapthalene | ‡ | 3400 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Bis(2-ethlyhexyl)phthalate | 48 | 4900 | ‡ | 20 | ‡ | ‡ | 150 | 150 | ‡ | ‡ | ‡ | ‡ |
| **Pesticides and PCBs (ug/L)** | | | | | | | | | | | | |
| alpha-BHC | ‡ | 0.3 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| Aroclor-1260 | ‡ | 19 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ |
| **Cyanides (ug/L)** | | | | | | | | | | | | |
| | ‡(b) | NA | 0.10 | ‡ | 0.09 | 0.02 | ‡ | ‡ | ‡ | ‡(b) | ‡(b) | 0.035(b) |

Table 3-11

Summary of Semi-Volatile Organic Compounds in Ground Water (ug/l) - T-Borings and Round 1
Pier 91 Facility, Chemical Processors, Inc., Seattle, WA

| SAMPLE NAME | CP-110 | TB-1 | TB-2 | TB-3 | TB-4 | TB-5 | TB-6 | TB-7 |
|---|---|---|---|---|---|---|---|---|
| PHENOL | | | 150 | 1.8 | 160 | | | 6.05 |
| 2-METHYLPHENOL | | | 110 | | 22 | | | |
| 4-METHYLPHENOL | | | 195 | | 80 | | | 9.9 |
| 2,4-DIMETHYLPHENOL | | | 220 | 1.3 | 130 | | | 86 |
| NAPTHALENE | | 3 | 380 | | 27 | | 42 | 29 |
| 4-CHLORO-3-METHYLPHENOL | | | | 25 | | | | |
| 2-METHYLNAPTHALENE | 75 | 2 | 1050 | | 18 | | 36 | 26 |
| ACENAPHTHYLENE | | | | | | | | |
| ACENAPTHENE | | 1 | 65 | 1.9 | | | 3 | 1.2 |
| 4-NITROPHENOL | | | | | 3.5 | | | |
| DIBENZOFURAN | 11 | 1 | 84 | | | | 15 | 1.5 |
| FLUORENE | 29 | 2.5 | 170 | 3.4 | | | 18 | 2.3 |
| PHENANTHRENE | 33 | 2 | 320 | 1.7 | | | 30 | 7 |
| ANTHRACENE | | | 20 | | | | 2 | |
| FLUORANTHENE | | 3.5 | 45 | 1.2 | | | 6 | |
| PYRENE | | 3 | 57 | 1.8 | | | 7 | |
| BENZO(A)ANTHRACENE | | | | | | | 5 | |
| BIS(2-ETHYLHEXYL)PHTHALATE | 110 | 72.5 | 1000 | 62 | 13 | 69 | 68 | 46 |
| DIETHYLPHTHALATE | | | | | | | | |
| CHRYSENE | | | 23 | 1.3 | | | | |
| DI-N-OCTYL PHTHALATE | | | | | | | | |
| BENZO(K)FLUORANTHENE | | | | 1.6 | | | 4 | |
| BENZO(A)PYRENE | | 1 | | 1.1 | | | 3 | |
| INDENO(1,2,3-CD)PYRENE | | | | 1.8 | | | | |
| DIBENZO(A,H)ANTHRACENE | | | | 1.1 | | | | |
| BENZO(GHI)PERYLENE | | | | 1.5 | | | | |

Comments:

* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Compounds not detected in any samples are excluded from table.
* Duplicate samples were averaged.
* Samples collected from 12/88 to 2/89.
* Chemical testing by ARI, Seattle, WA.

Table 3-9 Summary of Volatile Organic Compounds in Ground Water (ug/l) - T-Borings and Round 1
Pier 91 Facility, Chemical Processors, Inc., Seattle, WA

| SAMPLE NAME | CP-110 | TB-1 | TB-2 | TB-3 | TB-4 | TB-5 | TB-6 | TB-7 |
|---|---|---|---|---|---|---|---|---|
| VINYL CHLORIDE | 1.5 | 14 | 38 | 4.1 | | | | |
| CHLOROETHANE | 43 | | 1800 | | | | 14 | |
| METHYLENE CHLORIDE | | 0.8 | 95 | 7.2 | | 2.2 | 13 | 385 |
| ACETONE | | | 2900 | 18 | | | | 450 |
| 1,1-DICHLOROETHENE | | 10.5 | 950 | 21 | | | 2.5 | |
| 1,1-DICHLOROETHANE | 2.7 | | | | | | | |
| 1,2-DICHLOROETHENE (TOTAL) | 2 | | | 2.7 | | | | |
| CHLOROFORM | | | | 1.2 | | | | 69 |
| 1,2-DICHLOROETHANE | | | | 1.1 | | | | |
| 2-BUTANONE | | | 2400 | 3.8 | | | | |
| TRANS-1,2-DICHLOROETHENE | | | 34 | | | | | |
| CIS-1,2-DICHLOROETHENE | | 7.3 | 20 | | | | | |
| 1,1,1-TRICHLOROETHANE | | 1.6 | | | | | | |
| 1,1,2-TRICHLORO-1,2,2-TRIFLUROETHANE | | 51 | | | | | | 76 |
| TRICHLOROETHENE | | 6.4 | | 1.5 | | | | |
| BENZENE | 15 | 2 | 97 | 1.6 | | | 29 | |
| 2-METHYL-2-PENTANONE | | | 1000 | | | | | |
| TETRACHLOROETHENE | | | | 1.4 | | | | |
| TOLUENE | 1.6 | 4.3 | 2400 | 3.5 | 60000 | 2.3 | 13 | 15000 |
| ETHYLBENZENE | | | 480 | 32 | 29000 | 4.4 | 6.9 | 16000 |
| TOTAL XYLENE | 1.6 | 3.2 | 1100 | 1.2 | 70000 | 13 | 24 | 41000 |

Comments:
* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Compounds not detected in any samples are excluded from table.
* Duplicate samples were averaged.
* Samples collected from 12/88 to 2/89.
* Chemical testing by ARI, Seattle, WA.

File Name: Soil.wr1
Revised: April 20, 1989 LMS

Table 3.2. Summary of Soils Testing Results - Organics and Metals
Pier 91, Chemical Processors, Inc., Seattle, Washington

| Well Number: | CP-103-B | CP-103-B | CP-103-B | CP 103-B | CP-104-A | CP-105-B | CP-105-B | CP-105-B | CP-106-A |
|---|---|---|---|---|---|---|---|---|---|
| Date: | 11/28/87 | 11/29/87 | 11/29/87 | 11/29/87 | 11/28/87 | 11/24/87 | 11/24/87 | 11/25/87 | 11/28/87 |
| Description: | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil |
| Sample Code: | 103A | 103B | 103C | 103D | 104A | 105A,B | 105C,D,E | 105F | 106A |
| Depth (ft.): | 20-21.5 | 30-31.5 | 40-41.5 | 65.5-66.5 | 10-12 | 4-10 Composite | 14-36 Composite | 56-58 | 9-12 |
| **Volatile Organics (ug/kg)** | | | | | | | | | |
| Toluene | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | 160 |
| **Total Metals (mg/kg)** | | | | | | | | | |
| Arsenic | 2.2 | 4.8 | 2.0 | 5.2 | 4.4 | 3.4 | 5.0 | 8.6 | 3.2 |
| Beryllium | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | 12 | ‡ |
| Chromium | 8 | 15 | 13 | 17 | 11 | 12 | 13 | 36 | 10 |
| Copper | 5 | 4 | 2 | 5 | 7 | 8 | 5 | 18 | 2 |
| Lead | 1.6 | 1.0 | 0.6 | 1.0 | 1.0 | 4.4 | 1.6 | 2.8 | 2.8 |
| Nickel | 14 | 24 | 16 | 23 | 21 | 16 | 18 | 45 | 15 |
| Zinc | 16 | 18 | 15 | 20 | 20 | 17 | 16 | 44 | 15 |

Comments:

1. Analytes are not shown on summary table when not detected at any sampling points.
2. All values reported are greater than minimum detection level.
3. (‡) Analyte not detected, or detected below minimum detection level.
4. Sampling Dates: November 24-29, 1987.
5. Sample analysis performed by Erco Laboratories.

Table 3-8 Summary of Semi-Volatile Compounds in Soil (ug/kg)
Pier 91 Facility, Chemical Processors, Inc., Seattle, WA

| Sample Name | TB-1-0-5 | TB-1-6-10 | TB-1-2.5 | TB-1-15 | TB-1-20 | TB-2-0-5 | TB-2-6-10 | TB-2-2.5 | TB-2-15 | TB-2-20 |
|---|---|---|---|---|---|---|---|---|---|---|
| PHENOL | | | | | | | | | | |
| 2,4-DIMETHYLPHENOL | | | | | | | | | | |
| NAPHTHALENE | | | | | | 4200 | 4300 | 91 | 760 | 100 |
| 2-METHYLNAPTHALENE | | 230 | | | | 15000 | 17000 | 100 | 1700 | 290 |
| ACENAPHTHENE | | 32 | | | | 880 | 660 | | 230 | |
| DIBENZOFURAN | | 49 | | | | 1100 | 1200 | | 180 | |
| FLUORENE | | 95 | | | | 2000 | 3900 | | 570 | 180 |
| PHENANTHRENE | 22 | 210 | 40 | | | 4600 | 4000 | | 1200 | 360 |
| ANTHRACENE | | | | | | | | | 71 | |
| FLUORANTHENE | | 89 | 92 | | | 560 | 730 | | 140 | |
| PYRENE | | | 150 | | | 910 | 480 | | 210 | |
| BENZO(A)ANTHRACENE | 23 | 30 | | | | 480 | 400 | | | |
| BIS(2-ETHYLHEXYL) PHTHALATE | | | | | | 330 | 480 | | | 84 |
| CHRYSENE | | | 97 | | | 530 | 380 | | 79 | |
| BENZO(B)FLUORANTHENE & BENZO(K)FLUORANTHENE | | | 210 | | | 820 | | | | |
| BENZO(A)PYRENE | 24 | | 87 | | | 470 | | | | |
| INDENO(1,2,3-CD)PYRENE | | | 86 | | | 490 | | | | |
| BENZO(GHI)PERYLENE | | | 71 | | | 440 | | | | |
| DIBENZO(A,H)ANTHRACENE | | | | | | | | | | |
| ACENAPTHYLENE | | | | | | | | | | |
| DIETHYLPHTALATE | | | | | | | | | | |
| DI-N-OCTYLPHTHALATE | | | | | | | | | | |

Comments:
* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Compounds not detected in any samples are excluded from table.
* Samples collected from 12/88 to 1/89.
* Chemical testing by ARI, Seattle, WA.

Table 3-5 Summary of Volatile Compounds in Soil (ug/kg)
Pier 91 Facility, Chemical Processors, Inc., Seattle, WA

| SAMPLE NAME | TB-1-0-5 | TB-1-6-10 | TB-1-2.5 | TB-1-15 | TB-1-20 | TB-2-0-5 | TB-2-6-10 | TB-2-2.5 | TB-2-15 | TB-2-20 |
|---|---|---|---|---|---|---|---|---|---|---|
| METHYLENE CHLORIDE | 3.6 | 8.3 | 5.7 | 170 | 8.7 | 2500 | 8700 | 7.3 | 12500 | 31 |
| ACETONE | | | | | | | | 88 | | |
| 1,1-DICHLOROETHANE | | | | | | 52 | | | | |
| 1,2-DICHLOROETHANE (TOTAL) | | | | | | | | | | |
| CHLOROFORM | | | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | | | 1.3 | | | 16 | | | | |
| 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE | | | | | | | | | | |
| TRICHLOROETHENE | 1.5 | | 3.1 | | | 17 | | | | |
| BENZENE | | | | | | 40 | | | | |
| TETRACHLOROETHENE | | | | | | 78 | | | | |
| TOLUENE | 0.8 | | 1 | | | 29000 | 14000 | 3.6 | 940 | 71 |
| CHLOROBENZENE | | | | | | | | | | |
| ETHYLBENZENE | | | | | | 15000 | 9700 | 3.6 | 930 | 100 |
| TOTAL XYLENE | 1.9 | | 2.6 | | | 34000 | 23000 | 8.5 | 2400 | 260 |

COMMENTS:

* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Compounds not detected in any samples are excluded from table.
* Samples collected from 12/88 to 1/89.
* Chemical testing by ARI, Seattle, WA.

Table 3-7 SUMMARY OF TRACE METALS IN SOIL (mg/kg)
Pier 91 Facility, Chemical Processors, Seattle, WA

| SAMPLE NAME | TB-1-0-5 | TB-1-6-10 | TB-1-2.5 | TB-1-15 | TB-1-20 | TB-2-0-5 | TB-2-6-10 | TB-2-2.5 | TB-2-15 | TB-2-20 |
|---|---|---|---|---|---|---|---|---|---|---|
| ARSENIC | 3.4 | 1.7 | 6.5 | 2 | 3.4 | 2.9 | 2.3 | 5.3 | 1.4 | 1.4 |
| CADMIUM | | | 1.3 | | | | | | | |
| CHROMIUM | 17 | 15 | 26 | 24 | 25 | 14 | 23 | 19 | 16 | 22 |
| COPPER | 70 | 8.9 | 2080 | 17 | 16 | 11 | 7.5 | 5.6 | 7.4 | 7.0 |
| LEAD | 30 | | 124 | | | 53 | 27 | 18 | 6.6 | 11 |
| MERCURY | | | | | | | | | | |
| NICKEL | 29 | 25 | 77 | 35 | 34 | 21 | 29 | 22 | 23 | 28 |
| ZINC | 52 | 21 | 242 | 28 | 28 | 66 | 38 | 33 | 23 | 27 |

COMMENTS:

* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Samples collected from 12/88 to 1/89
* Chemical testing by CAS, Longview, WA

Table 3-6

Summary of Semi-Volatile Compounds in Soil (ug/kg)
Pier 91 Facility, Chemical Processors, Inc., Seattle, WA

| Sample Name | TB-7-15 | TB-7-20 | TB-7-25 | CP-107-0-5 | CP-107-6-10 | CP-107-2.5 | CP-107-6.5 | CP-107-15 |
|---|---|---|---|---|---|---|---|---|
| PHENOL | | | | | | | | |
| 2,4-DIMETHYLPHENOL | | | | | | | | |
| NAPHTHALENE | 900 | | | | | | | |
| 2-METHYLNAPTHALENE | 2400 | 400 | | 9700 | 12000 | | 29000 | 200 |
| ACENAPHTHENE | 120 | | | 570 | 850 | | 700 | 66 |
| DIBENZOFURAN | 160 | | | 1000 | 2000 | | 2500 | 84 |
| FLUORENE | 520 | | | 1900 | 4200 | | 6100 | 170 |
| PHENANTHRENE | 1100 | 250 | | 3400 | 6100 | | 9000 | 180 |
| ANTHRACENE | | | | | 290 | | 260 | |
| FLUORANTHENE | 150 | | | 510 | 960 | | 1000 | |
| PYRENE | 22 | 40 | | 450 | 860 | 67 | 640 | |
| BENZO(A)ANTHRACENE | | | | 160 | 210 | 110 | 320 | 16 |
| BIS(2-ETHYLHEXYL) PHTHALATE | 500 | | | | | | | |
| CHRYSENE | 140 | 50 | | 210 | 270 | 170 | 320 | 17 |
| BENZO(B)FLUORANTHENE & BENZO(K)FLUORANTHENE | | | | 300 | 230 | 480 | 480 | |
| BENZO(A)PYRENE | | | | 130 | 130 | 200 | 100 | |
| INDENO(1,2,3-CD)PYRENE | | | | 96 | | 150 | 140 | |
| BENZO(GHI)PERYLENE | | | | 69 | | 78 | 390 | |
| DIBENZO(A,H)ANTHRACENE | | | | | | | 420 | |
| ACENAPTHYLENE | | | | | | | | |
| DIETHYLPHTALATE | | | | | | | | |
| DI-N-OCTYLPHTHALATE | 180 | | | | | | | |

Comments:

* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Compounds not detected in any samples are excluded from table.
* Samples collected from 12/88 to 1/89.
* Chemical testing by ARI, Seattle, WA.

Table 3-5

Summary of Volatile Compounds in Soil (ug/kg)
Pier 91 Facility, Chemical Processors, Inc., Seattle, WA

| SAMPLE NAME | TB-7-20 | TB-7-25 | CP-107-0-5 | CP-107-6-10 | CP-107-2.5 | CP-107-6.5 | CP-107-15 |
|---|---|---|---|---|---|---|---|
| METHYLENE CHLORIDE | | | 43 | 34 | | | 64 |
| ACETONE | 1400 | 22 | | | | | |
| 1,1-DICHLOROETHANE | | | | | | | |
| 1,2-DICHLOROETHANE (TOTAL) | | | | | | | |
| CHLOROFORM | | | | | | | |
| 1,1,1-TRICHLOROETHANE | | | | | | | |
| 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE | | 3.2 | | | | | |
| TRICHLOROETHENE | | | | | | | |
| BENZENE | | | | 11 | | | |
| TETRACHLOROETHENE | | | | | | | |
| TOLUENE | 6500 | 630 | | | | | |
| CHLOROBENZENE | | | | | | | |
| ETHYLBENZENE | 12000 | 450 | 120 | 82 | | 400 | |
| TOTAL XYLENE | 31000 | 4800 | 40 | 48 | | | |

COMMENTS:

* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Compounds not detected in any samples are excluded from table.
* Samples collected from 12/88 to 1/89.
* Chemical testing by ARI, Seattle, WA.

Table 3-7

SUMMARY OF TRACE METALS IN SOIL (mg/kg)
Pier 91 Facility, Chemical Processors, Seattle, WA

| SAMPLE NAME | CP-107-0-5 | CP-107-6-10 | CP-107-2.5 | CP-107-15 | CP-108-A-0-5 | CP-108-A-6-10 | CP-108-A-2.5 | CP-108-A-15 | CP-108-A-20 |
|---|---|---|---|---|---|---|---|---|---|
| ARSENIC | 1.6 | 1.7 | 2.4 | 3.7 | 2 | 2.8 | 1.5 | 2 | 2 |
| CADMIUM | | | | | | | | | |
| CHROMIUM | 12 | 18 | 14 | 18 | 12 | 13 | 12 | 16 | 20 |
| COPPER | 13 | 6.0 | 11 | 5.4 | 9.7 | 6.8 | 7.3 | 6 | 7.3 |
| LEAD | 9.5 | | 9.2 | | 38 | | | | |
| MERCURY | | | | | | | | | |
| NICKEL | 20 | 22 | 19 | 27 | 21 | 21 | 21 | 22 | 28 |
| ZINC | 45 | 23 | 63 | 22 | 32 | 17 | 16 | 18 | 20 |

COMMENTS:

* Blanks in table are non-detection or interpreted as non-detection.
* Data have been adjusted, where appropriate, for blank detections.
* Samples collected from 12/88 to 1/89
* Chemical testing by CAS, Longview, WA

Total Metals in Soil
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | DEPTH | Silver mg/kg | Arsenic mg/kg | Barium mg/kg | Beryllium mg/kg | Cadmium mg/kg | Chromium mg/kg | Copper mg/kg |
|---|---|---|---|---|---|---|---|---|---|
| CP-112 | 10/10/92 | 2.0 | <0.41 | 4.7 | 125 | 0.57 | 0.46 | 18.5 | 33.0 |
| CP-112 | 10/10/92 | 6.0 | <0.39 | 1.7 | 19.5 | 0.35 | 0.27 | 23.2 | 8.4 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed All values represent total concentrations unless noted
# = Highest of Multiple Results ??? = Duplicate Results
Depths in feet below ground surface

Total Metals in Soil
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | DEPTH | Mercury mg/kg | Nickel mg/kg | Lead mg/kg | Selenium mg/kg | Zinc mg/kg |
|---|---|---|---|---|---|---|---|
| CP-112 | 10/10/92 | 2.0 | 0.043 | 33.7 | 36.1 | <0.42 | 41.2 |
| CP-112 | 10/10/92 | 6.0 | <0.020 | 29.2 | 3.7 | <0.42 | 22.0 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed All values represent total concentrations unless noted
# = Highest of Multiple Results ??? = Duplicate Results
Depths in feet below ground surface

Semivolatile Organic Compounds
Detections in Soil
USEPA Method 8270
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | DEPTH | Acenaphthylene ug/kg | Phenanthrene ug/kg | Anthracene ug/kg | Di-n-butyl phthalate ug/kg | Fluoranthene ug/kg | Pyrene ug/kg | Butyl benzyl phthalate ug/kg |
|---|---|---|---|---|---|---|---|---|---|
| CP-112 | 10/10/92 | 2.0 | (620) J | (2200) J | (500) J | 5900 B | 3700 | 6600 | (1900) JB |
| CP-112 | 10/10/92 | 6.0 | <1000 | <1000 | <1000 | <1000 | <1000 | <1000 | <1000 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed All values represent total concentrations unless noted
Hits only # = Highest of Multiple Results ??? = Duplicate Results
Depths in feet below ground surface J = Estimated value B = Analyte found in blank and sample

Semivolatile Organic Compounds
Detections in Soil
USEPA Method 8270
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | DEPTH | Benzo(a) anthracene ug/kg | Chrysene ug/kg | Benzo(b) fluoranthene ug/kg | Benzo(a)pyrene ug/kg | Indeno (1,2,3-cd) pyrene ug/kg | Dibenz(a,h) anthracene ug/kg | Benzo(ghi) perylene ug/kg |
|---|---|---|---|---|---|---|---|---|---|
| CP-112 | 10/10/92 | 2.0 | 3000 | 3900 | 5600 | 3500 | 3000 | (700) J | 3200 |
| CP-112 | 10/10/92 | 6.0 | <1000 | <1000 | <1000 | <1000 | <1000 | <1000 | (110) J |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed All values represent total concentrations unless noted
Hits only # = Highest of Multiple Results ??? = Duplicate Results
Depths in feet below ground surface J = Estimated value B = Analyte found in blank and sample

Volatile Organic Compounds
Detections in Soil
USEPA Method 8240
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | DEPTH | Methylene chloride ug/kg | Acetone ug/kg | 2-Hexanone ug/kg | Toluene ug/kg |
|---|---|---|---|---|---|---|
| CP-112 | 10/10/92 | 2.0 | 8.5 B | 6.8 B | 5.6 | 2.5 |
| CP-112 | 10/10/92 | 6.0 | 3.9 B | 11 B | <6.6 | <1.3 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed All values represent total concentrations unless noted
Hits only # = Highest of Multiple Results ??? = Duplicate Results
Depths in feet below ground surface J = Estimated value B = Analyte found in blank and sample

Total Petroleum Hydrocarbons
Detections in Soil
USEPA Methods 418.1 and 8015 Modified
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | DEPTH | TPH 418.1 mg/kg | TPH USEPA Method 8015 (Modified) mg/kg |
|---|---|---|---|---|
| CP-112 | 10/10/92 | 2.0 | 420 | 2400 |
| CP-112 | 10/10/92 | 6.0 | 64 | 120 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed All values represent total concentrations unless noted
# = Highest of Multiple Results ??? = Duplicate Results
Depths in feet below ground surface

Polychlorinated Biphenyls
Detections in Soil
USEPA Method 8080
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | DEPTH | PCB-1016 ppb | PCB-1221 ppb | PCB-1232 ppb | PCB-1242 ppb | PCB-1248 ppb | PCB-1254 ppb | PCB-1260 ppb |
|---|---|---|---|---|---|---|---|---|---|
| CP-112 | 10/10/92 | 2.0 | <33 | <33 | <33 | <33 | <33 | <33 | <33 |
| CP-112 | 10/10/92 | 6.0 | <33 | <33 | <33 | <33 | <33 | <33 | <33 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed All values represent total concentrations unless noted
# = Highest of Multiple Results ??? = Duplicate Results
Depths in feet below ground surface

Dissolved Metals in Groundwater
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | Dissolved Silver mg/l | Dissolved Arsenic mg/l | Dissolved Barium mg/l | Dissolved Beryllium mg/l | Dissolved Cadmium mg/l | Dissolved Chromium mg/l | Dissolved Copper mg/l | Dissolved Mercury mg/l |
|---|---|---|---|---|---|---|---|---|---|
| CP-104A | 04/05/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| CP-104A | 07/06/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| CP-107 | 04/08/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| CP-107 | 07/13/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| CP-112 | 04/07/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| CP-112 | 07/08/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| MW-39-3 | 04/14/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| MW-39-3 | 07/13/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.005 | <0.025 | <0.0002 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted

# = Highest of Multiple Results ??? = Duplicate Results

For RCL D METALS

Dissolved Metals in Groundwater
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | Dissolved Nickel mg/l | Dissolved Lead mg/l | Dissolved Selenium mg/l | Dissolved Zinc mg/l |
|---|---|---|---|---|---|
| CP-104A | 04/05/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| CP-104A | 07/06/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| CP-107 | 04/08/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| CP-107 | 07/13/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| CP-112 | 04/07/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| CP-112 | 07/08/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| MW-39-3 | 04/14/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| MW-39-3 | 07/13/93 | <0.040 | <0.003 | <0.005 | <0.020 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted

# = Highest of Multiple Results ??? = Duplicate Results

For RCL D METALS

Total Metals in Groundwater
Burlington Environmental inc.
Pier 91 Facility

| SITE | DATE | Silver mg/l | Arsenic mg/l | Barium mg/l | Beryllium mg/l | Cadmium mg/l | Chromium mg/l | Copper mg/l | Mercury mg/l |
|---|---|---|---|---|---|---|---|---|---|
| CP-104A | 04/05/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| CP-104A | 07/06/93 | <0.010 | 0.010 | <0.20 | <0.005 | <0.005 | <0.010 | 0.042 | <0.0002 |
| CP-107 | 04/08/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| CP-107 | 07/13/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| CP-112 | 04/07/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| CP-112 | 07/08/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| MW-39-3 | 04/14/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.010 | <0.025 | <0.0002 |
| MW-39-3 | 07/13/93 | <0.010 | <0.010 | <0.20 | <0.005 | <0.005 | <0.005 | <0.025 | <0.0002 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted

# = Highest of Multiple Results ??? = Duplicate Results

For RCL T METALS

Total Metals in Groundwater
Burlington Environmental inc.
Pier 91 Facility

| SITE | DATE | Nickel mg/l | Lead mg/l | Selenium mg/l | Zinc mg/l |
|---|---|---|---|---|---|
| CP-104A | 04/05/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| CP-104A | 07/06/93 | <0.040 | 0.005 | <0.005 | <0.020 |
| CP-107 | 04/08/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| CP-107 | 07/13/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| CP-112 | 04/07/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| CP-112 | 07/08/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| MW-39-3 | 04/14/93 | <0.040 | <0.003 | <0.005 | <0.020 |
| MW-39-3 | 07/13/93 | <0.040 | <0.003 | <0.005 | <0.020 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted

# = Highest of Multiple Results ??? = Duplicate Results

For RCL T METALS

Semivolatile Organic Compounds
Detections in Groundwater
USEPA Method 8270
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | Naphthalene ug/l | 2-Methyl naphthalene ug/l | Acenaphthene ug/l | Dibenzofuran ug/l | Fluorene ug/l | Hexachloro benzene ug/l | Phenanthrene ug/l | Anthracene ug/l |
|---|---|---|---|---|---|---|---|---|---|
| CP-104A | 04/05/93 | (5.5) J | (3.9) J | 42 | (4.8) J | 27 | <9.8 | (4.0) J | (2.4) J |
| CP-104A | 07/06/93 | <10 | <10 | 23 | (2.6) J | (8.9) J | (3.2) JB | <10 | <10 |
| CP-107 | 04/08/93 | <9.9 | (3.6) J | (4.0) J | (1.8) J | (7.6) J | <9.9 | (3.4) J | <9.9 |
| CP-107 | 07/13/93 | <10 | (3.7) J | (3.1) J | (1.6) J | (6.2) J | <10 | (2.5) J | <10 |
| CP-112 | 04/07/93 | <9.9 | <9.9 | <9.9 | <9.9 | <9.9 | <9.9 | <9.9 | <9.9 |
| CP-112 | 07/08/93 | <10 | <10 | (2.8) J | <10 | <10 | <10 | <10 | <10 |
| MW-39-3 | 04/14/93 | (3.2) J | 35 | (7.3) J | <10 | 10 | <10 | (4.2) J | <10 |
| MW-39-3 | 07/13/93 | (1.4) J | 27 | (4.6) J | (1.3) J | (6.9) J | <10 | (3.0) J | <10 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted
Hits only # = Highest of Multiple Results ??? = Duplicate Results
J = Estimated value B = Analyte found in blank and sample

Semivolatile Organic Compounds
Detections in Groundwater
USEPA Method 8270
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | Di-n-butyl-phthalate ug/l | Fluoranthene ug/l | Pyrene ug/l | bis(2-Ethyl hexyl)phthalate ug/l |
|---|---|---|---|---|---|
| CP-104A | 04/05/93 | (7.7) J | (5.7) J | (2.7) J | (3.5) J |
| CP-104A | 07/06/93 | (3.2) J | <10 | <10 | <10 |
| CP-107 | 04/08/93 | (6.0) J | <9.9 | <9.9 | <9.9 |
| CP-107 | 07/13/93 | <10 | <10 | <10 | <10 |
| CP-112 | 04/07/93 | (3.0) J | <9.9 | <9.9 | (2.2) J |
| CP-112 | 07/08/93 | <10 | <10 | <10 | <10 |
| MW-39-3 | 04/14/93 | 11 B | <10 | <10 | <10 |
| MW-39-3 | 07/13/93 | <10 | <10 | <10 | <10 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted
Hits only # = Highest of Multiple Results ??? = Duplicate Results
J = Estimated value B = Analyte found in blank and sample

Volatile Organic Compounds
Detections in Groundwater
USEPA Method 8240
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | Vinyl chloride ug/l | Methylene chloride ug/l | Acetone ug/l | 1,1-Dichloro ethane ug/l | Trichloroethene ug/l | Benzene ug/l | Toluene ug/l | Ethyl benzene ug/l |
|---|---|---|---|---|---|---|---|---|---|
| CP-104A | 04/05/93 | (3.8) J | <5 | (1.4) B | 15 | (2.5) J | (1.1) J | 10 | (4.2) J |
| CP-104A | 07/06/93 | (2.6) J | <5 | <25 | 6.9 | <5 | <5 | 8.7 | (4.9) J |
| CP-107 | 04/08/93 | <20 | 42 B | (11) J | (2.6) J | <10 | <10 | <10 | <10 |
| CP-107 | 07/13/93 | <20 | 36 | <50 | <10 | <10 | (3.0) J | (1.8) J | (2.6) J |
| CP-112 | 04/07/93 | <10 | (0.73) JB | <50 | (1.7) J | (1.1) J | (1.8) J | <5 | <5 |
| CP-112 | 07/08/93 | <20 | <10 | <50 | <10 | <10 | <10 | <10 | <10 |
| MW-39-3 | 04/14/93 | (4.1) JB | (1.0) JB | (4.4) JB | 10 | <5 | 14 | 6.9 | 11 |
| MW-39-3 | 07/13/93 | (2.7) J | <10 | <50 | (3.0) J | <10 | (6.2) J | (4.0) J | (2.6) J |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted
Hits only # = Highest of Multiple Results ??? = Duplicate Results
J = Estimated value B = Analyte found in blank and sample

Volatile Organic Compounds
Detections in Groundwater
USEPA Method 8240
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | Total xylenes ug/l | Chloroethane ug/l |
|---|---|---|---|
| CP-104A | 04/05/93 | 20 | (4.1) J |
| CP-104A | 07/06/93 | 27 | (2.5) J |
| CP-107 | 04/08/93 | (4.0) J | 55 |
| CP-107 | 07/13/93 | (4.8) J | <20 |
| CP-112 | 04/07/93 | <5 | (3.2) J |
| CP-112 | 07/08/93 | <10 | (5.8) J |
| MW-39-3 | 04/14/93 | 60 | 130 |
| MW-39-3 | 07/13/93 | (9.7) J | 88 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted

Hits only # = Highest of Multiple Results ??? = Duplicate Results

J = Estimated value B = Analyte found in blank and sample

Total Petroleum Hydrocarbons
Detections in Groundwater
USEPA Methods 8015 Modified and 418.1
Burlington Environmental inc.
Pier 91 Facility

| SITE | DATE | TPFH Method 8015 (Modified) mg/l | TPH 418.1 mg/l |
|---|---|---|---|
| CP-104A | 04/05/93 | <0.75 | 15 |
| CP-104A | 07/06/93 | <0.75 | <1.0 |
| CP-107 | 04/08/93 | <0.75 | 3.5 |
| CP-107 | 07/13/93 | <0.75 | 5.5 |
| CP-112 | 04/07/93 | <0.75 | 2.8 |
| CP-112 | 07/08/93 | <0.75 | 4.4 |
| MW-39-3 | 04/14/93 | 1.6 | 54 |
| MW-39-3 | 07/13/93 | <0.75 | 12 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted

# = Highest of Multiple Results ??? = Duplicate Results

For RCL TPH

Polychlorinated Biphenyls
Detections in Groundwater
USEPA Method 8080
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | PCB-1016 ug/l | PCB-1221 ug/l | PCB-1232 ug/l | PCB-1242 ug/l | PCB-1248 ug/l | PCB-1254 ug/l | PCB-1260 ug/l |
|---|---|---|---|---|---|---|---|---|
| CP-104A | 04/05/93 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| CP-104A | 07/06/93 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| CP-107 | 04/08/93 | --- | --- | --- | --- | --- | --- | --- |
| CP-107 | 07/13/93 | --- | --- | --- | --- | --- | --- | --- |
| CP-112 | 04/07/93 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| CP-112 | 07/08/93 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| MW-39-3 | 04/14/93 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| MW-39-3 | 07/13/93 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted

# = Highest of Multiple Results ??? = Duplicate Results

For RCL PCB-SAS

WTPH-HCID
Light Non-Aqueous Phase Liquid
Burlington Environmental Inc.
Pier 91 Facility

| SITE | DATE | Gasoline (C7 - C12) mg/kg | Diesel (>C12 - C24) mg/kg | Heavy Oil (C24+) mg/kg |
|---|---|---|---|---|
| CP-107 | 04/08/93 | 20 + | 50 + | <100 |
| MW-39-3 | 04/14/93 | 20 + | 50 + | 100 + |

< = Not detected at indicated reporting limit --- = Not sampled and/or analyzed Values represent total concentrations unless noted
# = Highest of Multiple Results ??? = Duplicate Results
+ = concentration equal to or greater than given value